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MECHANICK EXERCISES

BY

JOSEPH MOXON.

* *

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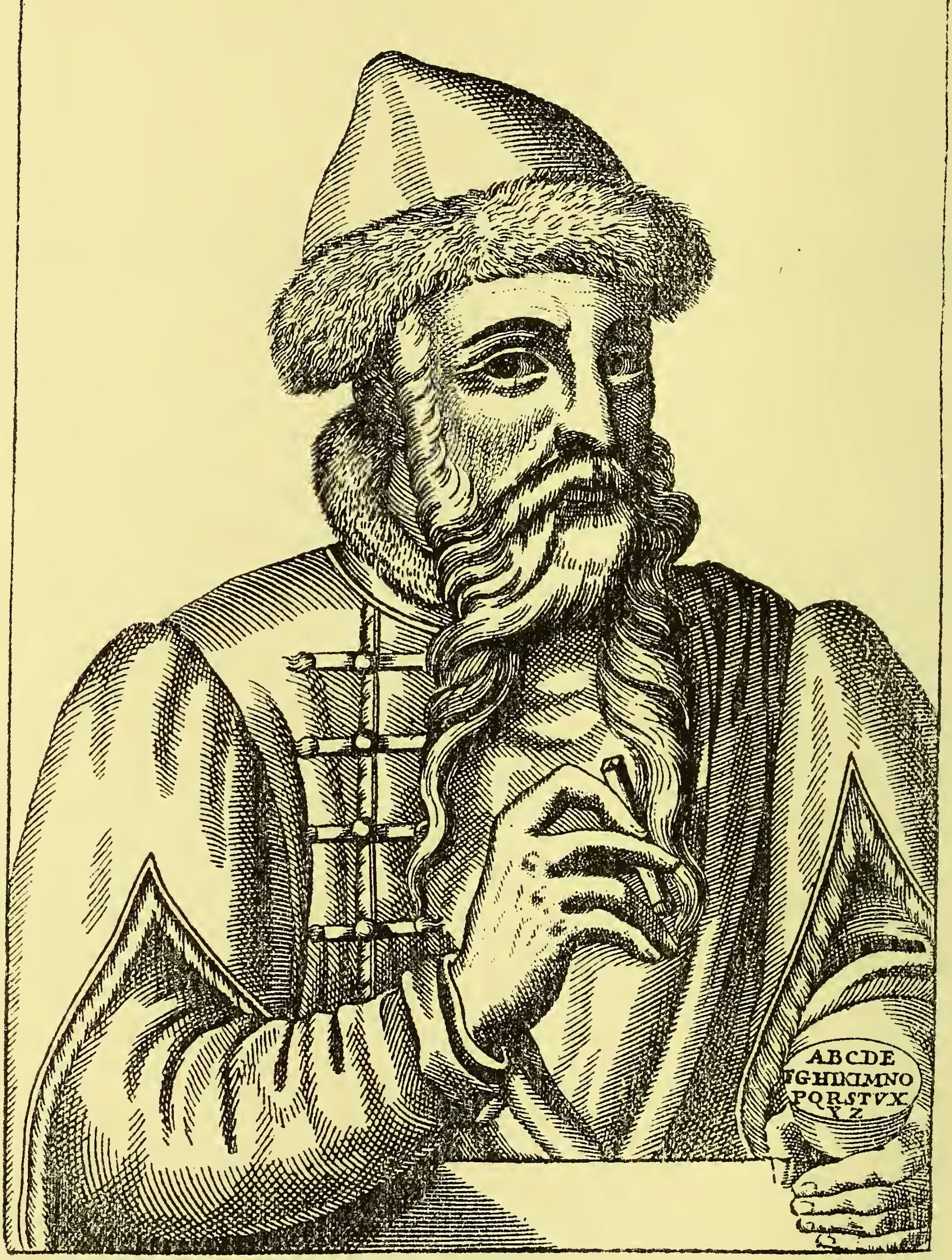
The true Effigies of Iohn Guttemberg *Delineated from the Original Painting at* Mentz *in Germanie.*



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The true Effigies of Laurenz Ians. Koſter. *Delineated from his Monumentall Stone Statue, Erected at* **Harlem.**

MEMORIÆ
SACRVM.

LAVRENTIO
COSTERO,
HARLEMENSI,
ALTERI CADMO,
ET ARTIS
TYPOGRAPHICÆ
CIRCA AN. DOM.
M. CCCC. XXX.
INVENTORI
PRIMO,

BENE DE LITERIS
AC TOTO ORBE
MERENTI, HANC
Q. L. C. Q.

STATVAM, QVIA
ÆREA AVT MAR-
MOREA DEFVIT,
IRO MONVMEN-
TO POSVIT CIVIS
GRATISSIMVS

PETRVS
SCRIVERIVS

1635.

MECHANICK EXERCISES:

Or, the Doctrine of

Handy-works.

Applied to the Art of

Printing.

The Second VOLUMNE.

By *Joſeph Moxon*, Member of the Royal
Society, and *Hydrographer* to the King's
Moſt Excellent Majeſty.

LONDON.
Printed for *Joſeph Moxon* on the Weſt-
ſide of *Fleet-ditch*, at the Sign of
Atlas. 1683.

9184

YHD. AAG (3)

To the Right Reverend Father in GOD,
JOHN Lord Biſhop of *Oxford*, and
Dean of *Chriſt-Church*; And to the
Right Honourable Sir *LEOLINE
JENKINS* Knight, and Principal
Secretary of State; And to the Right
Honourable Sir *JOSEPH WILLIAMSON*
Knight; and one of His Majeſties
moſt Honourable Privy-Council.

Right Honourable.

Y*Our ardent affections to promote* Typographie *has eminently appeared in the great Charge you have been at to make it famous here in* England; *whereby this Royal Iſland ſtands particularly obliged to your Generous and Publick Spirits, and the whole Common-Wealth of Book-men throughout the World, to your Candid Zeal for the promulgation of good Learning.*

Wherefore I humbly Dedicate this Piece of Typographie *to your Honours; and* *as it is (I think) the firſt of this nature, ſo I hope you will favourably excuſe ſmall Faults in this Undertaking; for great ones I hope there are none, unleſs it be in this preſumptuous* Dedication; *for which I humbly beg your Honours pardon: Subſcribing my ſelf, My Lord and Gentlemen,*

Your Honours moſt Humble
and Obedient Servant.

Joſeph Moxon.

MECHANICK

MECHANICK EXERCISES:

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The Second VOLUMNE.

PREFACE.

B*Efore I begin with* Typographie, *I ſhall ſay ſome-what of its Original Invention; I mean here in* Europe, *not of theirs in* China *and other Eaſtern Countries, who (by general aſſent) have had it for many hundreds of years, though their Invention is very different from ours; they Cutting their Letters upon Blocks in whole Pages or Forms, as among us our Wooden Pictures are Cut: But* Printing *with ſingle Letters Caſt in Mettal, as with us here in* Europe, *is an Invention ſcarce above Two hundred and fifteen years old; and yet an undecidable Controverſie about the original Contriver or Contrivers remains on foot,* *between the* Harlemers *of* Holland, *and thoſe of* Mentz *in* Germany: *But becauſe the difference cannot be determin'd for want of undeniable Authority, I ſhall only deliver both their Pleas to this* Scientifick Invention.

The Harlemers *plead that* Lawrenſz Janſz Koſter of Harlem *was the firſt Inventer of* Printing, *in the year of our Lord* 1430. *but that in the Infancy of this Invention he uſed only Wooden Blocks (as in* China, *&c. aforeſaid) but after ſome time he left off Wood, and Cut ſingle Letters in Steel, which he ſunck into Copper* Matrices, *and fitting them to Iron Molds, Caſt ſingle Letters of Mettal in thoſe* Matrices. *They ſay alſo, that his Companion,* John Gutenberg, *ſtole his Tools away while he was at Church, and with them went to* Mentz *in* Germany, *and there ſet his Tools to work, and promoted His claim to the firſt Invention of this Art, before* Koſter *did His.*

To prove this, they ſay that Rabbi Joſeph (*a Jew*) *in his Chronicle, mentions a Printed Book that he ſaw in* Venice, *in the year* 5188. *according to the Jewiſh Account, and by ours the year* 1428. *as may be read in* Pet. Scriverius.

They ſay much of a Book intituled De Spiegel, *Printed at* Harlem *in* Dutch *and* Latin; *which Book is yet there to be ſeen: and they alledge that Book the firſt that ever was Printed: But yet ſay not when this Book was Printed.*

Notwithſtanding this Plea, I do not find (perhaps becauſe of their imperfect Proofs) but that Gutenberg *of* Mentz *is more generally accepted for the firſt Inventer of* Printing, *than* Koſter *of* Harlem.

The Learned Dr. Wallis *of* Oxford, *hath made an Inquiry into the original of this Invention, and hath in brief ſum'd up the matter in theſe words.*

About the year of our Lord 1460. The Art of *Printing* began to be invented and practiſed in *Germany*, whether firſt at *Mentz* or firſt at *Harlem* it is not agreed: But it ſeems that thoſe who had it in conſideration before it was brought to perfection, diſagreeing among themſelves, did part Company; and ſome of them at *Harlem*, others at *Mentz* perſued the deſign at the ſame time.

The Book which is commonly reputed to have been firſt Printed is, Tullies Offices, *of which there be Copies extant (as a Rarity) in many Libraries; which in the cloſe of it is ſaid to be Printed at* Mentz, *in the year of our Lord* 1465. (*ſo ſays that Copy in the* Bodleyan *Library*) *or* 1466. (*ſo that in the Library of* Corpus Chriſti.) *The words in the cloſe of that in* Corpus Chriſti *Colledge* Oxon *are theſe,*

Præſens *Marcij Tullij* Clariſſimum opus, *Johanes Huſt, Moguntinus* Civis, non Atrimento, plumali canna, neq; ærea, ſed Arte quadam perpulchra, *Petri* manu *Petri* de *Geurſhem* pueri mei, feliciter effeci, finitum Anno MCCCCLXVI quarto die Menſis *Februarij*.

The like in the Bodleyan *Library; ſave there the Date is only thus;* Finitum Anno MCCCCLXV. *In the ſame Book there are theſe written Notes ſubjoyned:* Hic eſt ille *Johannes Fauſtus*, coadjutor *Johannes Gutenbergij* primi *Typographiæ* inventaris, Alter coadjuto erat *Petrus Schæfer*, i. Opilio. Quovix.

Cælando promptior alter erat, inquit *Johan. Arnoldus* in Libello de Chalcographiæ inventione, *Scheffer* primas finxit quas vocant *Matrices*. Hi tres exercuerunt artem primo in communi mox rupto fœdere ſeorſim ſibi quiſq; privatim.

And again (in a later hand) Inventionem artis *Typographicæ* ad Annum 1453. aut exerciter referunt Sabillicus *En.*10.lib.6.& *Monſterus.*Alij ad Annum 1460. Vide *Polid. Virg.* lib. 2. de Invent. Rerum; *Theod. Bibland. de Ratione communis linguarum.* cap. de *Chalcographia.*

At Harlem *and ſome other places in* Holland, *they pretend to have Books Printed ſomewhat ancienter than this; but they are moſt of them (if not all) done by way of Carving whole Pages in Wood, not by ſingle Letters Caſt in Mettal, to be Compoſed and Diſtributed as occaſion ſerves, as is now the manner.*

The chief Inventer at Harlem *is ſaid to be* Laurens Janſz Koſter.

After theſe two places (Mentz *and* Harlem) *it ſeems next of all to have been practiſed at* Oxford : *For by the care, and at the charge of King* Henry *the 6th, and of* Thomas Bourchier *then Arch-Biſhop of* Canterbury (*and Chancellour of the Univerſity of* Oxford) Robert Turner *Maſter of the Robe, and* William Caxton *a Merchant of* London *were for that purpoſe ſent to* Harlem, *at the charges partly of the King, partly of the Arch Biſhop, who then (becauſe theſe of* Harlem *were very chary of this ſecret) prevailed privately with one* Frederick Corſeles *an under-Workman, for a ſum of Money, to come over hither; who thereupon did at* Oxford *ſet up the Art of* Printing, *before it was exerciſed any where elſe in* England, *or in* France, Italy, Venice, Germany, *or any other place, except only* Mentz *and* Harlem (*aforementioned*): *And there be ſeveral Copies yet extant (as one in the Archives of the Univerſity of* Oxford, *another in the Library of Dr.* Tho. Barlow, *now Biſhop of* Lincoln) *of a Treatiſe* *of St.* Jerome *(as it is there called (becauſe found among St.* Jerom's *Works) or rather* Ruffinus *upon the Creed, in a broad* Octavo) *Printed at* Oxford *in the year* 1468. *as appears by the words in the cloſe of it.*

Explicit expoſitio Sancti *Jeronimi* in ſembolo Apoſtolorum ad papam Laurentium Impreſſi *Oxonie* & finita Anno Domini MCCCCLXVIII. xvij die *Decembris.*

Which is but three years later than that of Tullies Offices *at* Mentz, *in* 1465. *and was perhaps one of the firſt Books Printed on Paper, (that of* Tully *being on Vellom.) And there the excerciſe of* Printing *hath continued ſucceſſively to this day.*

Soon after William Caxton *(the ſame I ſuppoſe who firſt brought it to* Oxford*) promoted it to* London *alſo, which* Baker *in his Chronicle (and ſome others) ſay to have been about the year* 1471. *but we have ſcarce any Copies of Books there Printed remaining (that I have ſeen) earlier than the year* 1480. *And by that time, or ſoon after, it began to be received in* Venice, Italy, Germany, *and other places, as appears by Books yet extant, Printed at divers places in thoſe Times. Thus far Dr.* Wallis.

But whoever were the Inventers of this Art, or (as ſome Authors will have it) Science; nay, Science of Sciences (ſay they) certain it is, that in all its Branches it can be deemed little leſs than a Science: And I hope I ſay not to much of Typographie: *For Dr.* Dee, *in his Mathematical Preface to* Euclids Elements of Geometrie, *hath worthily taken pains to make* Architecture *a Mathematical Science; and as a vertual Proof of his own Learned Plea, quotes two Authentique Authors,* viz.

Vitruvius

Vitruvius *and* Leo Baptiſta, *who. both give their deſcriptions and applauſe of* Architecture*: His Arguments are ſomewhat copious, and the Original eaſily procurable in the Engliſh Tongue; therefore inſtead of tranſcribing it, I ſhall refer my Reader to the Text it ſelf.*

Upon the conſideration of what he has ſaid in behalf of Architecture, *I find that a* Typographer *ought to be equally quallified with all the Sciences that becomes an* Architect, *and then I think no doubt remains that* Typographie *is not alſo a Mathematical Science.*

For my own part, I weighed it well in my thoughts, and find all the accompliſhments, and ſome more of an Architect *neceſſary in a* Typographer: *and though my buſineſs be not Argumentation, yet my Reader, by peruſing the following diſcourſe, may perhaps ſatisfie himſelf, that a* Typographer *ought to be a man of Sciences.*

By a Typographer, *I do not mean a* Printer, *as he is Vulgarly accounted, any more than Dr.* Dee *means a* Carpenter *or* Maſon *to be an* Architect: *But by a* Typographer, *I mean ſuch a one, who by his own Judgement, from ſolid reaſoning with himſelf, can either perform, or direct others to perform from the beginning to the end, all the Handy-works and Phyſical Operations relating to* Typographie.

Such a Scientifick *man was doubtleſs he who was the firſt Inventer of* Typographie; *but I think few have ſucceeded him in Science, though the number of* Founders *and* Printers *be grown very many: Inſomuch that for the more eaſie managing of* Typographie, *the Operators have found it neceſſary to devide it into ſeveral Trades, each of which (in the ſtricteſt ſence) ſtand no* *nearer related to* Typographie, *than* Carpentry *or* Maſonry, *&c. are to* Architecture. *The ſeveral deviſions that are made, are,*

Firſt *The* Maſter Printer, *who is as the Soul of* Printing; *and all the Work-men as members of the Body governed by that Soul ſubſerveient to him; for the* Letter-Cutter *would Cut no Letters, the* Founder *not ſinck the* Matrices, *or Caſt and Dreſs the Letters, the* Smith *and* Joyner *not make the* Preſs *and other Utenſils for* Printing, *the* Compoſiter *not Compoſe the Letters, the* Correcter *not read Proves, the* Preſs-man *not work the Forms off at the the* Preſs, *or the* Inck-maker *make* Inck *to work them with, but by Orders from the* Maſter-Printer.

Secondly, The Letter-Cutter,
Thirdly, The Letter-Caſter, } Founders.
Fourthly, The Letter-Dreſſer.

But very few Founders *exerciſe, or indeed can perform all theſe ſeveral Trades; though each of theſe are indifferently called* Letter-Founders.

Fifthly, The Compoſiter,
Sixthly, The Correcter, } Printers.
Seventhly, The Preſs-man,
Eighthly, The Inck-maker.

Beſides ſeveral other Trades they take in to their Aſſiſtance; as the Smith, *the* Joyner, *&c.*

ADVER-

ADVERTISEMENT.

THE continuation of my ſetting forth *Mechanick Exerciſes* having been obſtructed by the breaking out of the Plot, which took off the minds of my few Cuſtomers from buying them, as formerly; And being of late much importun'd by many worthy Perſons to continue them; I have promiſed to go on again, upon Condition, That a competent number of them may be taken off my hand by Subſcribers, ſoon after the publication of them in the *Gazet*, or poſting up Titles, or by the *Mercurius Librarius*, &c.

Therefore ſuch Gentlemen or others as are willing to promote the coming forth of theſe *Exerciſes*, are deſired to Subſcribe their Names and place of abode: That ſo ſuch Perſons as live about this City may have them ſent ſo ſoon as they come forth: Quick Sale being the beſt encouragement.

Some Gentlemen (to whom they are very acceptable) tell me they will take them when all *Trades* are finiſh't, which cannot reaſonably be expected from me (my Years conſidered) in my life-time; which implies they will be Cuſtomers when I'me dead, or perhaps by that time ſome of themſelves.

The price of theſe Books will be 2 *d.* for each Printed Sheet. And 2 *d.* for every Print taken off of Copper Cuts.

There are three reaſons why this price cannot be thought dear.

1. The Writing is all new matter, not Collected, or Tranſlated from any other Authors: and the drafts of the Cuts all drawn from the Tools and Machines uſed in each reſpective Trade.

2. I Print but 500 on each Sheet, And thoſe upon good Paper: which makes the charge of Printing dear, proportionable to great numbers.

3. Some Trades are particularly affected by ſome Cuſtomers, (who deſire not the reſt,) and conſequently ſooner ſold off, which renders the remainder of the un-ſold *Exerciſes* unperfect, and therefore not acceptable to ſuch as deſire all: ſo that they will remain as waſte-Paper on my hands.

JOSEPH MOXON.

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§ 2. *Of the Office of a Maſter*-Printer.

I Shall begin with the Office of a *Maſter-Printer*, becauſe (as aforeſaid) he is the Director of all the Work men, he is the Baſe (as the *Dutchmen* properly call him) on which the Workmen ſtand, both for providing Materials to Work withal, and ſucceſſive variety of Directions how and in what manner and order to perform that Work.

His Office is therefore to provide a Houſe, or Room or Rooms in which he is to ſet his *Printing-Houſe*. This expreſſion may ſeem ſtrange, but it is *Printers* Language: For a *Printing Houſe* may admit of a twofold meaning; one the Vulgar acceptance, and is relative to the Houſe or Place wherein *Printing* is uſed; the other a more peculiar Phraſe *Printers* uſe among themſelves, *viz.* only the *Printing* Tools, which they frequently call a *Printing Houſe*: Thus they ſay, Such a One has ſet up a *Printing Houſe*, when as thereby they mean he has furniſh'd a Houſe with *Printing* Tools. Or ſuch a one has remov'd his *Printing-Houſe*, when thereby they only mean he has remov'd the Tools us'd in his former Houſe. Theſe expreſſions have been uſed Time out of mind, and are continued by them to this day.

But to proceed, Having conſider'd what number of *Preſſes* and *Caſes* he ſhall uſe, he makes it his buſineſs to furniſh himſelf with a Room or Rooms well-lighted, and of convenient capacity for his number of *Preſſes* and *Caſes*, allowing for each *Preſs* about Seven Foot ſquare upon the Floor, and for every *Frame* of *Caſes* which holds Two pair of *Caſes*, *viz.* one pair *Romain* and one pair *Itallica*, Five Foot and an half in length (for ſo much they contain) and Four Foot and an half in breadth, though they contain but Two Foot and Nine Inches: But then room will be left to paſs freely between two *Frames*.

We will ſuppoſe he reſolves to have his *Preſſes* and *Caſes* ſtand in the ſame Room (though in *England* it is not very cuſtomary) He places the *Caſes* on that ſide the Room where they will moſt conveniently ſtand, ſo, as when the *Compoſiter* is at work the Light may come in on his Left-hand; for elſe his Right hand plying between the Window-light and his Eye might ſhadow the *Letter* he would pick up: And the *Preſſes* he places ſo, as the Light may fall from a Window right before the *Form* and *Tinpan*: And if ſcituation will allow it, on the North-ſide the Room, that the *Preſs-men*, when at their hard labour in *Summer* time, may be the leſs uncommoded with the heat of the *Sun*: And alſo that they may the better ſee by the conſtancy of that Light, to keep the whole *Heap* of an equal Colour.

He is alſo to take care that his *Preſſes* have a ſolid and firm Foundation, and an even Horizontal Floor to ſtand on, That when the *Preſſes* are ſet up their Feet ſhall need no Underlays, which both damage a *Preſs*, are often apt to work out, and conſequently ſubject it to an unſtable and looſe poſition, as ſhall further be ſhewn when we come to the Setting up of the *Preſs*.

And as the Foundation ought to be very firm, ſo ought alſo the Roof and Sides of the *Preſs Room* to be, that the *Preſs* may be faſtned with Braces overhead and on its Sides, as well and ſteddy as under foot.

He is alſo to take care that the Room have a clear, free and pretty lofty Light, not impeded with the ſhadow of other Houſes, or with Trees; nor ſo low that the Sky-light will not reach into every part of the Room: But yet not too high, leſt the violence of *Winter* (*Printers* uſing generally but Paper-windows) gain too great advantage of Freeſing the Paper and Letter, and ſo both Work and Workman ſtand ſtill. Therefore he ought to Philoſophize with himſelf, for the making the height of his Lights to bear a rational proportion to the capacity of the Room.

Here being but two ſides of the Room yet uſed, he places the *Correcting ſtone* againſt a good Light, and as near as he can towards the middle of the Room, that the *Compoſiters* belonging to each end of the Room may enjoy an equal acceſs to it. But ſometimes there are ſeveral *Correcting-ſtones* plac'd in ſeveral parts of the Room.

The *Lye-Trough* and *Rincing-Trough* he places towards ſome corner of the Room, yet ſo as they may have a good Light; and under theſe he cauſes a *Sink* to be made to convey the Water out of the Room: But if he have other conveniencies for the placing theſe Troughs, he will rather ſet them out of the Room to avoid the ſlabbering they cauſe in.

About the middle of the Room he places the *Deſtributing Frame* (*viz* the *Frame* on which the *Forms* are ſet that are to be *Deſtributed*) which may ſtand light enough, though it ſtand at ſome conſiderable diſtance from the Window.

In ſome other empty place of the Room (leaſt frequented) he cauſes ſo many *Neſt-Frames* to be made as he thinks convenient to hold the *Caſes* that may lye out of preſent uſe; and the *Letter-boards* with *Forms* ſet by on them, that both the *Caſes* and the *Forms* may be the better ſecured from running to *Pye*.

Having thus contrived the ſeveral Offices of the Room, He furniſhes it with *Letters*, *Preſſes*, *Caſes*, *Chaſes*, *Furniture*, &c. Of each of which in Order.

¶. 2. *Of*

¶. 2. *Of* Letter.

He provides a *Fount* (properly a *Fund*) of *Letter* of all Bodies; for moſt *Printing-Houſes* have all except the two firſt, *viz.* *Pearl, Nomparel, Brevier, Long-Primmer, Pica, Engliſh, Great Primmer, Double-Pica, Two-Lin'd-Engliſh, Great-Cannon.*

Theſe are the *Bodies* moſt of uſe in *England*; But the *Dutch* have ſeveral other *Bodies*: which becauſe there is little and almoſt no perceivable difference from ſome of theſe mentioned, I think they are not worth naming. Yet we have one *Body* more which is ſometimes uſed in *England*; that is a *Small Pica*, but I account it no great diſcretion in a *Maſter Printer* to provide it; becauſe it differs ſo little from the *Pica*, that unleſs the Workmen be carefuller than they ſometimes are, it may be mingled with the *Pica*, and ſo the Beauty of both *Founts* may be ſpoil'd.

Theſe aforeſaid *Bodies* are commonly *Caſt* with a *Romain*, *Italica*, and ſometimes an *Engliſh Face*. He alſo provides ſome *Bodies* with the *Muſick*, the *Greek*, the *Hebrew*, and the *Syriack Face*: But theſe, or ſome of theſe, as he reckons his oppertunities may be to uſe them.

And that the Reader may the better underſtand the ſizes of theſe ſeveral *Bodies*, I ſhall give him this Table following; wherein is ſet down the number of each *Body* that is contained in one Foot.

Pearl,	184	contained in one Foot.
Nomparel,	150	
Brevier,	112	
Long-Primmer,	92	
Pica,	75	
Engliſh,	66	
Great-Primmer,	50	
Double-Pica,	38	
Two Lin'd Engliſh,	35	
Great-Cannon.	17½	

His care in the choice of theſe *Letters* are,

Firſt, That the *Letter* have a true ſhape: Which he may know, as by the §. of *Letter-Cutting*.

I confeſs this piece of Judgement, *viz.* knowing of true Shape, may admit of ſome controverſy; becauſe neither the Ancients whom we received the knowledge of theſe *Letters* from, nor any other authentick Authority have delivered us Rules, either to make or know true ſhape by: And therefore it may be objected that every one that makes *Letters* but tolerably like *Romain*, *Italick*, &c. may pretend his to be true ſhap'd.

To this I anſwer, that though we can plead no Ancient Authority for the ſhape of *Letters*, yet doubtleſs (if we judge rationally) we muſt conclude that the *Romain Letters* were Originally invented and contrived to be made and conſiſt of Circles, Arches of Circles, and ſtraight Lines; and therefore thoſe *Letters* that have theſe Figures, either entire, or elſe properly mixt, ſo as the Courſe and Progreſs of the

Pen may beſt admit, may deſerve the name of true Shape, rather than thoſe that have not.

Beſides, Since the late made *Dutch-Letters* are ſo generally, and indeed moſt deſervedly accounted the beſt, as for their Shape, conſiſting ſo exactly of Mathematical Regular Figures as aforeſaid, And for the commodious Fatneſs they have beyond other *Letters*, which caſing the Eyes in Reading, renders them more Legible ; As alſo the true placing their Fats and their Leans, with the ſweet driving them into one another, and indeed all the accompliſhments that can render *Letter* regular and beautiful, do more viſibly appear in them than in any *Letters* Cut by any other People : And therefore I think we may account the Rules they were made by, to be the Rules of true ſhap'd *Letters*.

For my own part, I liked their *Letters* ſo well, eſpecially thoſe that were Cut by *Chriſtophel Van Dijck* of *Amſterdam*, that I ſet my ſelf to examine the Proportions of all and every the parts and Members of every *Letter*, and was ſo well pleaſed with the Harmony and Decorum of their Symetrie, and found ſo much Regularity in every part, and ſo good reaſon for his Order and Method, that I examined the biggeſt of his *Letters* with Glaſſes, which ſo magnified the whole *Letter*, that I could eaſily diſtinguiſh, and with ſmall Deviders meaſure off the ſize, ſcituation and form of every part, and the proportion every part bore to the whole; and for my own future ſatisfaction collected my Obſervations into a Book, which I have inſerted in my *Exerciſes* on *Letter-Cutting*. For therein I have exhibited to the World the true Shape of *Chriſtophel Van Dijcks* aforeſaid *Letters*, largely Engraven in Copper Plates.

Whence I conclude, That ſince common conſent of Book men aſſign the Garland to the *Dutch-Letters* as of late *Cut*, and that now thoſe *Letters* are reduced unto a Rule, I think the Objection is Anſwered; And our *Maſter Printers* care in the choice of good and true ſhap'd *Letters* is no difficult Task: For if it be a large Bodied *Letter*, as *Engliſh*, *Great-Primmer* and upwards, it will ſhew it ſelf; and if it be ſmall, as *Pearl*, *Nomparel*, &c. though it may be difficult to judge the exact Symetry with the naked Eye, yet by the help of a *Magnifying-Glaſs* or two if occaſion be, even thoſe ſmall *Letters* will appear as large as the biggeſt Bodied *Letters* ſhall to the naked Eye: And then it will be no difficult Task to judge of the Order and Decorum even of the ſmalleſt Bodied *Letters*. For indeed, to my wonder and aſtoniſhment, I have obſerv'd *V. Dijcks Pearl Dutch Letters* in Glaſſes that have Magnified them to great *Letters*, and found the whole Shape bear ſuch true proportion to his great *Letters*, both for the *Thickneſs*, *Shape*, *Fats* and *Leans*, as if with Compaſſes he could have meaſur'd and ſet off in that ſmall compaſs every particular Member, and the true breadth of every *Fat* and *Lean Stroak* in each *Letter*, not to exceed or want (when magnified) of *Letter Cut* to the *Body* it was Magnified to.

His ſecond care in the choice of *Letters* is, That they be deep *Cut*; for then they will *Print* clear the longer, and be leſs ſubject to entertain *Picks*.

His third care, That they be deep ſunck in the *Matrices*,

Matrices leaſt the bottom line of a *Page* Beard. Yet though they be deep ſunk, His care ought to be to ſee the Beard alſo well cut off by the *Founder*.

And a Fourth Care in the choice of *Letter* is, That his *Letter* be Caſt upon good Mettal, that it may laſt the longer.

Of each Body he provides a *Fount* ſuitable to ſuch ſorts of Work as he deſigns to do ; But he provides not an equal wieght of every *Fount* ; Becauſe all theſe Bodies are not in equal uſe : For the *Long-Primmer*, *Pica* and *Engliſh* are the Bodies that are generally moſt uſed ; And therefore he provides very large *Founts* of theſe, *viz.* of the *Long-Primmer* in a ſmall *Printing-Houſe*, Five hundred Pounds weight *Romain* and *Italica*, whereof One hundred and fifty Pounds may be *Italica*. Of the *Pica* and *Engliſh*. *Roman* and *Italica*, Eight, Nine hundred, or a Thouſand Pounds weight : when as of other *Founts* Three or Four hundred Pounds weight is accounted a good *Fount* : And of the *Cannon* and *Great-Cannon* , One hundred Pounds or ſomewhat leſs may ſerve his turn ; Becauſe the common uſe of them is ſo ſet Titles with.

Beſides *Letters* he Provides Characters of Aſtronomical Signs, *Planets*. *Aſpects*,*Algebraical* Characters, Phyſical and Chimical Characters, &c. And theſe of ſeveral of the moſt uſed Bodies.

He Provides alſo *Flowers* to ſet over the Head of a *Page* at the beginning of a Book : But they are now accounted old-faſhion, and therefore much out of uſe. Yet *Wooden-Borders*, if well Drawn, and neatly Cut, may be *Printed* in a Creditable Book, As alſo, *Wooden-Letters* well Drawn and neatly Cut may be uſed at the beinning of a *Dedication, Preface, Section,* &c. Yet inſtead of *Wooden Letters*, *Capitals* Caſt in Mettal generally now ſerves; becauſe but few or good *Cutters* in *Wood* appear.

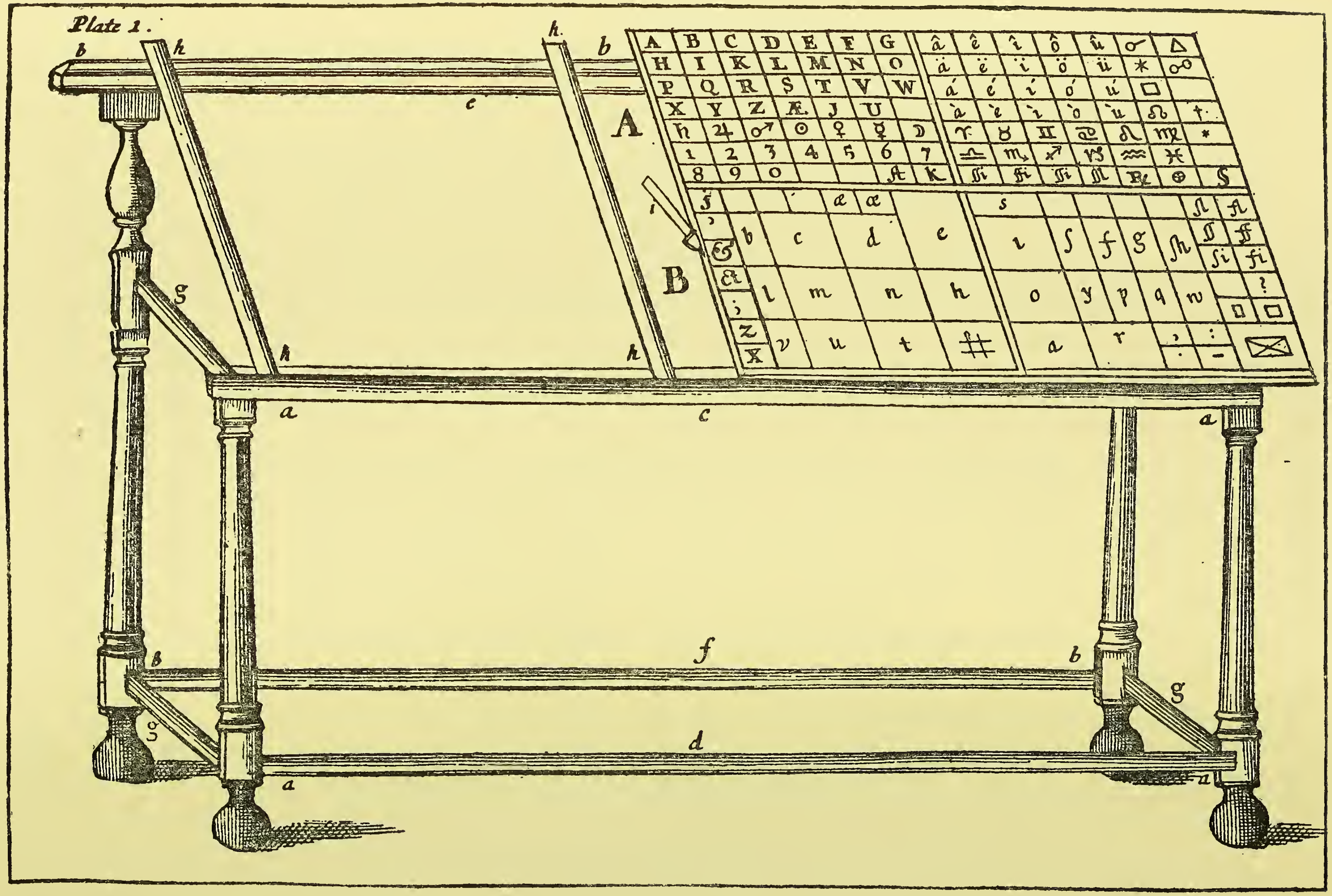
He alſo provides *Braſs Rules* of about Sixteen Inches long, that the *Compoſiter* may cut them into ſuch Lengths as his Work requires.

In the choice of his *Braſs Rules*, he examines that they be exactly *Letter* high; for if they be much too high, they may cut through *Paper*, *Tinpan* and *Blankets* too: And if they be but a little too high, not only the Sholder, or Beard, on either ſide them will *Print* black; but they will bear the *Plattin* off the *Letters* that ſtand near them, ſo that thoſe *Letters* will not *Print* at all: And if they be too low, then the *Rules* themſelves will not *Print*.

It ſometimes happens through the unskilfulneſs of the *Joyner*, (for they commonly, but unproperly, imploy *Joyners* to make them) that a Length ſhall be hollow in the middle both on the Face and Foot, and ſhall run driving higher and higher towards both ends: Hence it comes to paſs, that when the *Compoſiter* cuts a piece of *Rule* to his intended Length, the *Rule* ſhall *Print* hard at one end, and the other ſhall not *Print* at all; So that he ſhall be forced to knock up the foot of the low end, as ſhall be ſhewn in its proper place.

But the careful *Maſter-Printer* having found that his *Braſs Rules* is *Letter* high all the whole Length, will alſo examine whether it be ſtraight all the whole Length, which he does by applying both the

Plate 1.



Face and Foot to the ſurface of the *Correcting-ſtone*; And if the Face and Foot comply ſo cloſely with the *Correcting-ſtone*, that light cannot be ſeen between them, he concludes the *Braſs-Rule* is ſtraight.

Then he examines the Face or Edge of the *Rule*, whether it have an Edge of an equal breadth all the whole Length, and that the Edge be neither too thick nor too fine for his porpoſe.

He ſhould alſo take care that the *Braſs*, before it be cut out, be well and skilfully Planiſh't, nor would that charge be ill beſtowd; for it would be ſaved out of the thickneſs of the *Braſs* that is commonly uſed: For the *Joyners* being unskilful in Planiſhing, buy Neal'd thick *Braſs* that the *Rule* may be ſtrong enough, and ſo cut it into ſlips witout Hammering, which makes the *Rule* eaſily bow any way and ſtand ſo, and will never come to ſo good and ſmooth an Edge as Planiſh't *Braſs* will. Beſides, *Braſs* well Planiſh't will be ſtiffer and ſtronger at half the thickneſs than unplaniſh't *Braſs* will at the whole: As I ſhall further ſhew when I come to Exerciſe upon *Mathematical Inſtrument-making*.

§. 3. *Of* Caſes.

Next he provides *Caſes*. A Pair of *Caſes* is an *Upper-Caſe* and a *Lower Caſe*.

The *Upper Caſe* and the *Lower-Caſe* are of an equal length, breadth and depth, *viz.* Two Foot nine Inches long, One Foot four Inches and an half broad, and about an Inch and a quarter deep, beſides the bottom Board; But for ſmall Bodied *Letters* they are made ſomewhat ſhallower, and for great Bodies deeper.

Long-Primmer and downwards are accounted ſmall Bodies; *Engliſh* and upwards are accounted great Bodies.

The conveniencies of a ſhallow *Caſe* is, that the *Letters* in each Box lye more viſible to the laſt, as being leſs ſhadowed by the ſides of the *Boxes*.

The conveniencies of a deep *Caſe* is, that it will hold a great many *Letters*, ſo that a *Compoſiter* needs not ſo often *Deſtribute*. 2dly. It is not ſo ſoon *Low*, (as *Compoſiters* ſay when the *Caſe* grows towards empty) and a *Low Caſe* is unconvenient for a *Compoſiter* to work at, partly becauſe the *Caſe* ſtanding ſhelving downwards towards them, the *Letters* that are in the *Caſe* tend towards the hither ſide of the *Caſe*, and are ſhadowed by the hither ſide of that *Box* they lye in, ſo that they are not ſo eaſily ſeen by the Eye, or ſo ready to come at with the Fingers, as if they lay in the middle of the *Box*.

Theſe *Caſes* are encompaſſed about with a *Frame* about Three quarters of an Inch broad, that the ends of the ſeveral partitions may be let into the ſubſtance of the *Frame*: But the hithermoſt ſide of the *Frame* is about half an Inch higher thanthe other ſides, that when either the *Galley* or another pair of *Caſes* are ſet upon them, the bottom edge of the *Galley*, or of thoſe *Caſes* may ſtop againſt that higher *Frame*, and not ſlide off.

Both the *Upper* and the *Lower Caſe* have a thick Partition about three quarters of an Inch broad, Duff-tail'd into the middle of the upper and under Rail of the *Frame*. This Partition is made thus broad, that Grooves may be made on either ſide of it to receive the ends of thoſe Partitions that devide the breadth of the *Caſe*, and alſo to ſtrengthen the whole *Frame*; for the bottom Board is as well nailed to this thick Partition as to the outer *Frame* of the *Caſe*.

But the deviſions for the ſeveral *Boxes* of the *Upper* and *Lower Caſes* are not alike: for each half of the whole length of the *Upper-Caſe* is devided into ſeven equal parts, as you may ſee in Plate 1. at A, and its breadth into ſeven equal parts, ſo that the whole *Upper-Caſe* is divided into Ninety eight ſquare *Boxes*, whoſe ſides are all equal to one another.

But the Two halfs of the length of the *Lower-Caſe* are not thus devided; for each half of the length of the *Lower-Caſe* is devided into Eight equal parts, and its breadth into Seven; but it is not throughout thus devided neither; for then the *Boxes* would be all of equal ſize: But the *Lower-Caſe* is devided into four ſeveral ſizes of *Boxes*, as you may ſee in Plate 1. B.

The reaſon of theſe different ſizes of *Boxes* is, That the biggeſt *Boxes* may be diſpoſed neareſt the *Compoſiters* hand, becauſe the Engliſh Language, and conſequently all Engliſh *Coppy* runs moſt upon ſuch and ſuch Sorts; ſo that the *Boxes* that holds thoſe Sorts ought to be moſt capacious.

His care in the choice of theſe *Caſes* is, That the Wood they are made of be well ſeaſon'd Stuff.

That the Partitions be ſtrong, and true let into one another, and that the ends fill up and ſtand firm in the Grooves of the *Frame* and middle *Rail* of the *Caſe*.

There is an inconvenience that often happens, theſe thin Partitions, eſpecially if they be made of unſeaſon'd Stuff. *viz.* as the Stuff dries it ſhrinks in the

Grooves of the *Frame*, and ſo not only grows looſe, but ſometimes ſtarts out above the top of the *Frame*. To prevent this inconvenience, I have of late cauſed the ends of theſe thin partitions to be made Male-Duſ-tails, broadeſt on the under ſide, and have them fitted into Female-Duſ-tails in the Frame of the *Caſe*, and middle Rail before the bottom Boards are nailed on.

That the Partitions be full an *Engliſh* Body thick.

That the Partitions lye cloſe to the bottom of the *Caſe*, that ſo the *Letters* ſlide not through an upper into an under *Box*, when the Papers of the *Boxes* may be worn.

§ 4. *Of* Frames *to ſet the* Caſes *on.*

Frames are in moſt *Printing Houſes* made of thick *Deal-board Batttens*, having their ſeveral *Rails Tennanted* into the *Stiles*: but theſe ſorts of *Frames* are, in reſpect of their matter (*viz. Fir*) ſo weak, and in reſpect of their ſubſtance (*viz.* little above an Inch thick) ſo ſlight, that experience teaches us, when they are even new made, they tremble and totter, and having laſted a little while, the thinneſs of their *Tennants* being a little above a quarter of an Inch thick, according to the Rules of *Joynery*, as I have ſhewn in *Numb.* 5. §. 17. They Craze, their *Tennants* break, or *Morteſſes* ſplit, and put the *Maſter-Printer* to a freſh Charge.

It is rationally to be imagined that the *Frames* ſhould be deſigned to laſt as long as the *Printing houſe*; and therefore our *Maſter-Printer* ought to take care that they be made of matter ſtrong enough, and of ſubſtance big enough to do the Service they are intended for; that they ſtand ſubſtantial and firm in their place, ſo as a ſmall Joſtle againſt them ſhake them not, which often reiterated weakens the *Frame-work*, and at that preſent is ſubject to ſhake the *Letter* in the *Galley* down.

I ſhall not offer to impoſe Rules upon any here, eſpecially ſince I have no Authority from Preſcript or Cuſtom; yet I ſhall ſet down the Scantlings that I my ſelf thought fit to uſe on this occaſion. A Delineation of the *Frames* are in Plate 1. at C.

a a a a The *Fore-Rails.*
b b b b The *Hind-Rails.*
c The *Top Fore-Rail.*
d The *Bottom-Fore-Rail.*
e The *Top Hind-Rail.*
f The *Bottom Hind-Rail.*
g g g g The *End-Rail.*
h h h h *Croſs-Bearers.*

I made the *Rails* and *Stiles* of well-ſeaſoned fine *Oak*, clean, (that is free from Knots and Shakes) the *Stiles* and *Rails* two Inches and an half ſquare, the Top and Bottom *Fore-Rails* and the Bottom *Hind-Rail* four Foot three Inches long, beſides their *Tennants*; And the Top *Hind Rail* five Foot three Inches long. The two *Fore-Rails* and Bottom *Hind-Rail* had Iron Female Screws let into them, which, through an hole made in the *Stiles*, received a Male-Screw with a long ſhank, and a Sholder at the end of it to ſcrew them tight and firm together, even as the Rails of a *Bedſted* are ſcrewed into the *Morteſſes* of a *Bed-Poſt*.

Each *Back Stile* was four Foot one Inch and an half high beſides their *Tennants,* and each *Fore Stile* three Foot three Inches high; each *Fore* and *Back-Stile* had two *Rails* one Foot ſeven Inches long, beſides their *Tennants* Tennanted and Pin'd into them, becauſe not intended to be taken aſſunder.

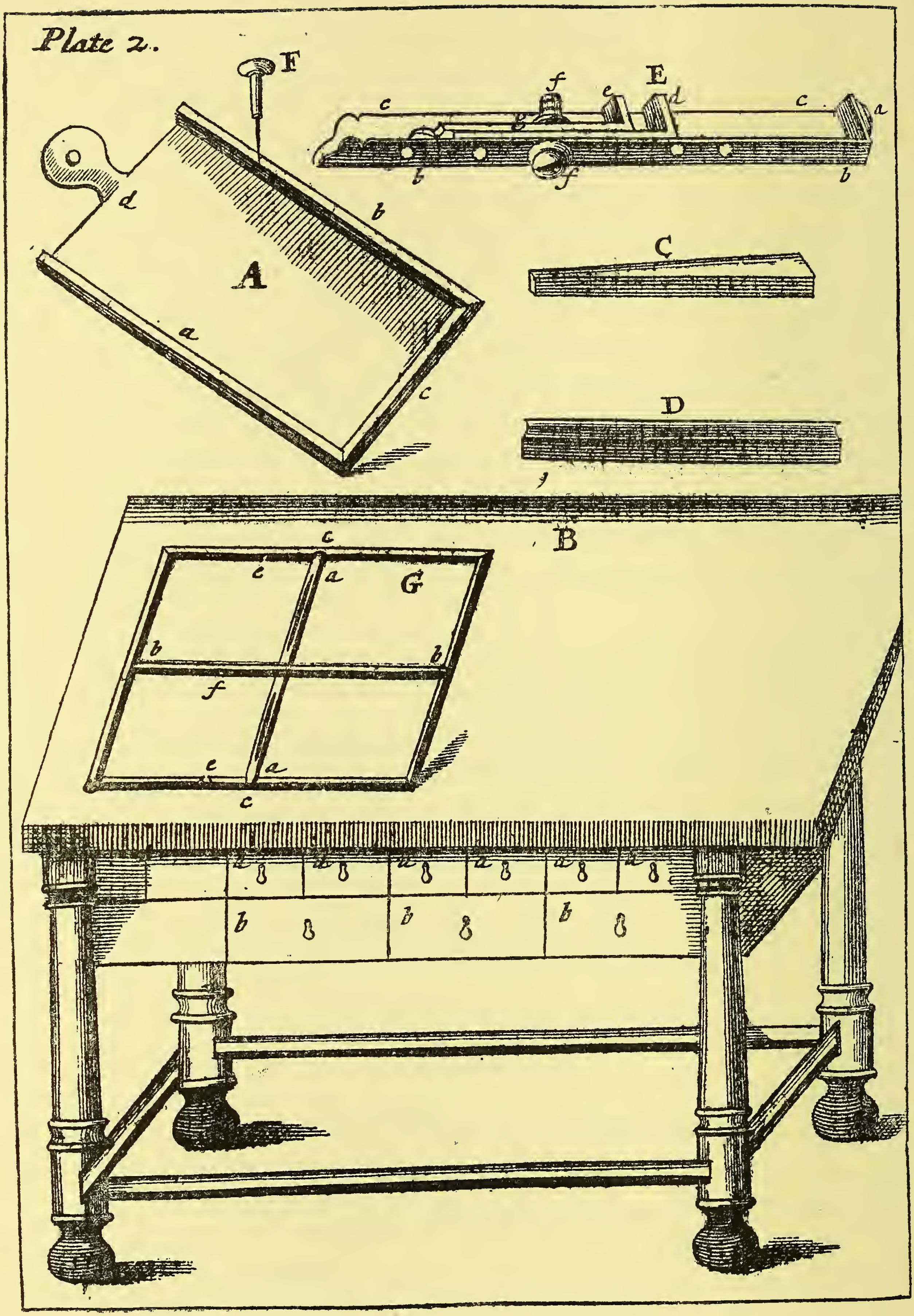
It muſt be conſidered, that the *Fore ſtiles* be of a convenient height for the pitch of an ordinary Man to ſtand and work at, which the heighth aforeſaid is; And that the *Hind ſtiles* be ſo much higher than the *Fore-ſtiles,* that when the *Croſs-Bearers* are laid upon the upper *Fore* and *Hind-Rail,* and the *Caſes* laid on them, the *Caſes* may have a convenient declivity from the upper ſide the *Upper-Caſe,* to the lower ſide the *Lower-Caſe*

The Reaſon of this declivity is, becauſe the *Caſes* ſtanding thus before the Workman, the farther *Boxes* of the *Upper-Caſe* are more ready and eaſie to come at, than if they lay flat; they being in this poſition ſomewhat nearer the hand, and the *Letters* in thoſe *Boxes* ſomewhat eaſier ſeen.

If the Workman prove taller than Ordinary, he lays another or two pair of *Caſes* under the *Caſes* he uſes, to mount them: If the Workman be ſhort, as Lads, &c. He lays a *Paper-board* (or ſometimes two) on the floor by the Fore-ſide of the *Frame,* and ſtanding to work on it, mounts himſelf.

The *Bearers* are made of *Slit-Deal,* about two Inches broad, and ſo long as to reach from the *Fore-Rail* through the *Upper-Rail,* and are let in, ſo as to lye even with the ſuperficies of the *Fore* and *Hind-Rail,* and at ſuch a diſtance on both the *Rails,* as you may ſee in the Figure.

Plate 2.



On the Superficies of the *Fore-Rail*, even with its Fore-Edge is nailed a ſmall *Riglet* about half an Inch high, and a quarter and half quarter of an Inch thick, that the *Caſes* ſet on the *Frame* having the aforeſaid declivity, may by it be ſtop't from ſliding off.

§. 5. *Of the* Galley.

• Our *Maſter-Printer* is alſo to provide *Galleys* of different ſizes, That the *Compoſiter* may be ſuited with ſmall ones when he *Compoſes* ſmall *Pages*, and with great ones for great *Pages*.

The *Galley* is marked A in Plate 2.

a b c The Sides or Frame of the *Galley*.
d The *Slice*.

Theſe *Galleys* are commonly made of two flat *Wainſcot Boards*, each about a quarter and half quarter of an Inch thick, the uppermoſt to ſlide in Grooves of the Frame, cloſe down to the undermoſt, though for ſmall *Pages* a ſingle Board with two ſides for the Frame may ſerve well enough: Thoſe *Wainſcot Boards* are an Oblong Square, having its length longer than its breadth, even as the form of a *Page* hath. The three Sides of the Frame are fixed faſt and ſquare down on the upper Plain of the undermoſt Board, to ſtand about three fifth parts of the height of the *Letter* above the ſuperficies of the *Slice*. The Sides of the Frame muſt be broad enough to admit of a pretty many good ſtrong *Oaken Pins* along the

the Sides, to be drove hard into the Bottom Board, and almoſt quite through the Sides of the Frame, that the Frame may be firmly fixed to it: But by no means muſt they be Glewed on to the Bottom Board, becauſe the *Compoſiter* may ſometimes have occaſion to wet the *Page* in the *Galley*, and then (the *Galley* ſtanding aſlope upon the *Caſe*) the Water will ſoak between the ſides of the Frame; and under Board, and quickly looſen it.

§. 6. *Of the* Correcting-ſtone.

The *Correcting-Stone* marked B in Plate 2. is made of *Marble, Purbeck*, or any other Stone that may be made flat and ſmooth: But yet the harder the Stone is the better; wherefore *Marble* is more preferable than *Purbeck*. Firſt, Becauſe it is a more compact Stone, having fewer and ſmaller Pores in it than *Purbeck*. And Secondly, becauſe it is harder, and therefore leſs ſubject to be prick'd with the corners of a *Chaſe*, if through careleſneſs (as it ſometimes happens) it be pitch'd on the Face of the Stone.

It is neceſſary to have it capacious, *viz.* large enough to hold two *Chaſes* and more, that the *Compoſiter* may ſometimes for his convenience, ſet ſome *Pages* by on it ready to *Impoſe*, though two *Chaſes* lye on the *Stone*: Therefore a *Stone* of about Four Foot and an half long, and Two Foot broad is a convenient ſize for the generality of Work.

This *Stone* is to be laid upon a ſtrong *Oaken*-wood Frame, made like the Frame of a common Table, ſo high, that the Face of the *Stone* may lye about three

Foot and an Inch above the Floor: And under the upper Rail of the Frame may be fitted a Row or two of Draw-Boxes, as at *a a a a a a* and *b b b* on each of its longeſt Sides to hold *Flowers*, *Braſs-Rules*, *Braces*, *Quotations*, ſmall *Scabbords*, &c.

§. 7. *Of* Letter-Boards, *and* Paper-Boards.

Letter-Boards are Oblong Squares, about two Foot long, eighteen Inches broad, and an Inch and a quarter thick. They ought to be made of clean and well-ſeaſon'd Stuff, and all of one piece: Their upper-ſide is to be Plained very flat and ſmooth, and their under-ſide is Clamped with pieces about two Inches ſquare, and within about four Inches of either end, as well to keep them from Warping, as to bear them off the Ground or any other Flat they ſtand on, that the Fingers of the *Compoſiter* may come at the bottom of the Board to remove it whither he will: They are commonly made of *Fir*, though not ſo thick as I have mentioned, or all of one Piece: *Deal-Boards* of this breadth may ſerve to make them of; but *Joyners* commonly put *Maſter-Printers* off with ordinary *Deal-Boards*, which not being broad enough, they joyn two together; for which cauſe they frequently ſhrink, ſo as the joynt comes aſſunder, and the *Board* becomes uſeleſs, unleſs it be to ſerve for a *Paper-Board* afterwards: For ſmall and thin *Letters* will, when the Form is open, drop through, ſo as the *Compoſiter* cannot uſe the Board.

I us'd to make them of *Sugar-Cheſt*; That Stuff being commonly well-ſeaſon'd, by the long lying of the

Sugar in it, and is beſides a fine hard Wood, and therefore leſs ſubject to be injured by the end of the *Shooting-Stick* when a *Form* is *Unlocking*.

Paper-Boards are made juſt like the *Letter-Boards*, though ſeldom ſo large, unleſs for great Work: Nor need ſuch ſtrict care be taken in making them ſo exactly ſmooth: their Office being only to ſet *Heaps of Paper* on, and to *Preſs* the *Paper* with.

§. 8. *Of* Furniture, Quoyns, Scabbord, *&c.*

By *Furniture* is meant the *Head-ſticks, Foot-ſticks, Side-ſticks, Gutter-ſticks, Riglets, Scabbords* and *Quoyns*.

Head-ſticks and all other *Furniture*, except *Scabbord*, are made of dry *Wainſcot*, that they may not ſhrink when the *Form* ſtands by; They are *Quadrat* high, ſtraight, and of an equal thickneſs all the length: They are made of ſeveral thickneſſes for ſeveral Works, *viz.* from a *Brevier* which ſerves for ſome *Quarto's* to ſix or eight *Pica* thick, which is many times us'd to *Folio's*: And many of the *Head-ſticks* may alſo ſerve to make Inner *Side-ſticks* of; for the *Maſter Printer* provides them of lengths long enough for the *Compoſiter* to cut to convenient Scantlins or Lengths, they being commonly about a Yard long when they come from the *Joyners*. And *Note*, that the *Head* and *Side-ſticks* are called *Riglets*, if they exceed not an *Engliſh* thick.

Outer *Side-ſticks* and *Foot-ſticks* marked C in Plate 2. are of the ſame heighth of the *Head-ſticks, viz. Quadrat* high, and are by the *Joyner* cut to the given length, and to the breadth of the particular *Pages* that are to be *Impoſed*: The *Side-ſticks* are placed againſt the outer ſide of the *Page*, and the *Foot-ſticks* againſt the foot or bottom of the *Page*: The outer ſides of theſe *Side* and *Foot-ſticks* are bevil'd or ſloped from the further to the hither end.

Gutter ſticks marked D in Plate 2. are as the former, *Quadrat* high, and are uſed to ſet between *Pages* on either ſide the *Croſſes*, as in *Octavo's*, *Twelves*, *Sixteens*, and *Forms* upwards; They are made of an equal thickneſs their whole length, like *Head-ſticks*; but they have a Groove, or Gutter laid on the upper ſide of them, as well that the Water may drain away when the *Form* is Waſhed or Rinced, as that they ſhould not *Print*, when through the tenderneſs of the *Tinpan*, the *Plattin* preſſes it and the *Paper* lower than ordinary.

Scabbord is that ſort of *Scale* commonly ſold by ſome *Iron-mongers* in Bundles; And of which the *Scabbords* for *Swords* are made: The *Compoſiter* cuts it *Quadrat* high, and to his Length.

The *Maſter-Printer* is to provide both *Thick* and *Thin Scabbord*, that the *Compoſiter* may uſe either when different Bodied *Letter* happens in a *Page*, to juſtifie the *Page* to a true length; And alſo that the *Preſsman* may chuſe *Thick* or *Thin* to make truer *Regiſter*, as ſhall be ſhewed in proper place.

Quoyns are alſo *Quadrat* high, and have one of their ſides Bevil'd away to comply with the Bevil of the *Side* and *Foot-ſticks*; they are of different Lengths, and different Breadths: The great *Quoyns* about three Inches ſquare, except the Bevil on one ſide as aforeſaid; and theſe ſizes deminiſh downwards to an Inch and an half in length, and half an Inch in breadth.

Of theſe *Quoyns* our *Maſter-Printer* provides ſeveral hundreds, and ſhould provide them of at the leaſt ten different Breadths between the aforeſaid ſizes; that the *Compoſiter* may chuſe ſuch as will beſt fit the *Chaſe* and *Furniture.*

The Office of theſe *Quoyns* are to *Lock* up the *Form, viz.* to wedge it up (by force of a *Mallet* and *Shooting-ſtick*) ſo cloſe together, both on the ſides and between Head and Foot of the *Page*, that every *Letter* bearing hard againſt every next *Letter*, the whole *Form* may *Riſe*; as ſhall be ſhewed hereafter.

Their farther Office is to make *Regiſter* at the *Preſs.*

§. 9. ¶. 1. *Of the* Mallet Shooting-ſtick *and* Dreſſing-Block, Compoſing-ſticks, Bodkin, *and* Chaſe. *&c.*

Printers Mallets have a *Cilindrick* Head, and a round Handle; The Head ſomewhat bigger, and the Handle ſomewhat longer than thoſe *Joyners* commonly uſe; Yet neither ſhape or ſize different for any reaſon to be given: But only a Cuſtom always uſed to have them ſo. The Head is commonly made of *Beech.*

¶. 2. *Of*

¶. 2. *Of the* Shooting-ſtick.

The *Shooting-ſtick* muſt be made of *Box*, which Wood being very hard, and withal tough, will beſt and longeſt endure the knocking againſt the *Quoyns*. Its ſhape is a perfect Wedge about ſix Inches long, and its thicker end two Inches broad, and an Inch and an half thick; and its thin end about an Inch and an half broad, and half an Inch thick.

¶. 3. *Of the* Dreſſing-Block.

The *Dreſſing Block* ſhould be made of *Pear-tree*, Becauſe it is a ſoft wood, and therefore leſs ſubject to injure the Face of the *Letter*; it is commonly about three Inches ſquare, and an Inch high. Its Office is to run over the Face of the *Form*, and whilſt it is thus running over, to be gently knock't upon with the Head of the *Shooting ſtick*, that ſuch *Letters* as may chance to ſtand up higher than the reſt may be preſſed down.

Our *Maſter-Printer* muſt alſo provide a pair of *Sheers*, ſuch as *Taylors* uſe, for the cutting of *Braſs-Rules*, *Scabbords*, &c.

A large *Spunge* or two, or more, he muſt alſo provide, one for the *Compoſiters* uſe, and for every *Preſs* one.

Pretty fine *Packthread* to tye up *Pages* with; But this is often choſen (or at leaſt directed) by the *Compoſiter*, either finer or courſer, according to the great or ſmall *Letter* he works upon.

¶. 4. *Of the* Compoſing-ſtick.

Though every *Compoſiter* by Cuſtom is to provide himſelf a *Compoſing-ſtick*, yet our *Maſter-Printer* ought to furniſh his Houſe with theſe Tools alſo, and ſuch a number of them as is ſuitable to the ſize of his Houſe; Becauſe we will ſuppoſe our *Maſter-Printer* intends to keep ſome Apprentices, and they, unleſs by contract or courteſie, are not uſed to provide themſelves *Compoſing-ſticks*: And beſides, when ſeveral *Compoſiters* work upon the ſame Book, their Meaſures are all ſet alike, and their *Titles* by reaſon of *Notes* or *Quotations* broader than their common Meaſure, So that a *Compoſing-ſtick* is kept on purpoſe for the *Titles*, which muſt therefore be common to all the *Compoſiters* that work upon that Work; And no one of them is obliged to provide a *Compoſing-ſtick* in common for them all: Therefore it becomes our *Maſter-Printers* task to provide them.

It is delineated in Plate 2. at *E*.

a The *Head.*
b b The *Bottom.*
c c The *Back.*
d The lower *Sliding-Meaſure*, or *Cheek.*
e The upper *Sliding-Meaſure*, or *Cheek.*
f f The *Male-Screw.*
g The *Female-Screw.*

Theſe *Compoſing-ſticks* are made of Iron Plate about the thickneſs of a thin *Scabbord*, and about ten

Inches long doubled up ſquare; ſo as the Bottom may be half an Inch and half a quarter broad, and the Back about an whole Inch broad. On the further end of this Iron Plate thus doubled up, as at *a* is Soldered on an Iron Head about a *Long-Primmer* thick; But hath all its outer edges Baſil'd and Fil'd away into a Molding: This Iron Head muſt be ſo let into the Plate, and Soldered on to it, that it may ſtand truly ſquare with the bottom, and alſo truly ſquare with the Back, which may be known by applying the outer ſides of a ſquare to the Back and Bottom; as I ſhewed, *Numb.* 3. *Fol.* 38, 39. About two Inches from the Head, in the Bottom, is begun a row of round holes about an Inch aſſunder, to receive the ſhank of the *Male-Screw* that ſcrews the *Sliding Meaſures* faſt down to the Bottom; ſo that the *Sliding-Meaſures* may be ſet nearer or further from the Head, as the Meaſure of a *Page* may require.

The lower *Sliding-Meaſure* marked *d* is an Iron Plate a *thick Scabbord* thick, and of the Breadth of the inſide of the Bottom; It is about four Inches long, and in its middle hath a Groove through it within half an Inch of the Fore-end, and three quarters of an Inch of the hinder end. This Groove is ſo wide all the way, that it may receive the Shank of the *Screw*. On the Fore-end of this Plate ſtands ſquare upright another Iron Head about a *Brevier* thick, and reaches ſo high as the top of the Back.

The upper *Sliding-Meaſure* is made juſt like the lower, only it is about three quarters of an Inch ſhorter.

Between theſe two *Sliding-Meaſures*, *Marginal Notes* are *Compoſed* to any Width.

Compoſiters commonly examine the Truth of their *Stick* by applying the head of the *Sliding-Meaſure* to the inſide of the Head of the *Stick*; and if they comply, they think they are ſquare and true made: But this Rule only holds when the Head it ſelf is ſquare. But if it be not, 'tis eaſy to file the *Sliding-Meaſures* to comply with them: Therefore, as aforeſaid, the ſquare is the only way to examine them by.

¶. 5. *Of the* Bodkin.

The *Bodkin* is delineated in Plate 2. at *F* Its *Blade* is made of *Steel*, and well tempered, its ſhape is round, and ſtands about two Inches without the *Shank* of the *Handle*. The *Handle* is turned of ſoft wood as *Alder*, *Maple*, &c. that when *Compoſiters* knock the Head of the *Bodkin* upon the Face of a Single *Letter* when it ſtands too high, it may not batter the Face.

¶. 6. *Of* Chaſes, *marked* G *on the* Correcting-Stone, *Plate* 2.

A *Chaſe* is an Iron Frame about two and twenty Inches long, eighteen Inches broad, and half Inch half quarter thick; and the breadth of Iron on every ſide is three quarters of an Inch: But an whole Inch is much better, becauſe ſtronger. All its ſides muſt ſtand exactly ſquare to each other; And when it is laid on the *Correcting-Stone* it muſt lye exactly flat, *viz.* equally bearing on all its ſides and Angles: The outſide and inſide muſt be Filed ſtraight and ſmooth. It hath two *Croſſes* belonging to it, *viz.* A *Short-Croſs* marked *a a* and a *Long-Croſs* marked *b b*: Theſe two *Croſſes* have on each end a Male Duſtail Filed Bevil away from the under to the upper ſide of the *Croſs*, ſo that the under ſide of the Duſtail is narrower than the upper ſide of the Duſtail. Theſe Male-Duſtails are fitted into Female-Duſtails, Filed in the inſide of the *Chaſe*, which are alſo wider on the upper ſide of the *Chaſe* than on the under ſide; becauſe the upper ſide of the *Croſs* ſhould not fall through the lower ſide. Theſe *Croſſes* are called the *Short* and the *Long Croſs*.

The *Short-Croſs* is Duſtail'd in as aforeſaid, juſt in the middle of the *Chaſe* as at *c c*, and the *Long-Croſs* in the middle of the other ſides the *Chaſe*, as at *d d*. The *Short-Croſs* is alſo Duſtail'd into Female-Duſtails, made as aforeſaid, about three Inches and an half from the middle, as at *e e*: So that the *Short Croſs* may be put into either of the Female-Duſtails as occaſion ſerves. The middle of theſe two *Croſſes* are Filed or notched half way through, one on its upper, the other on its under ſide to let into one another, *viz.* the *Short-Croſs* is Filed from the upper towards the under ſide half way, and the *Long-Croſs* is Filed from the lower towards the upper-ſide half way: The *Croſſes* are alſo thus let into each other, where they meet at *f*, when the *Short-Croſs* is laid into the other Female-Duſtails fitted to it at *e e*.

In the middle, between the two edges of the upper ſide of the *Short-Croſs*, is made two Grooves parallel to the ſides of the *Croſs*, beginning at about two Inches from each end. and ending at about ſeven Inches from each end: It is made about half an Inch deep all the way, and about a quarter of an Inch broad, that the *Points* may fall into them. The *Short-Croſs* is about three quarters of an Inch thick, and the *Long Croſs* about half that thickneſs. All their ſides muſt be Fil'd ſtraight and ſmooth, and they muſt be all the way of an equal thickneſs.

Hitherto our *Maſter-Printer* hath provided Materials and Implements only for the *Compoſiters* uſe; But he muſt provide Machines and Tools for the *Preſsmans* to uſe too: which (becauſe I am loath to diſcourage my Cuſtomers with a ſwelling price at the firſt reviving of theſe Papers) I ſhall (though againſt my intereſt) leave for the ſubject of the next ſucceeding *Exerciſes.*

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Plate 3.

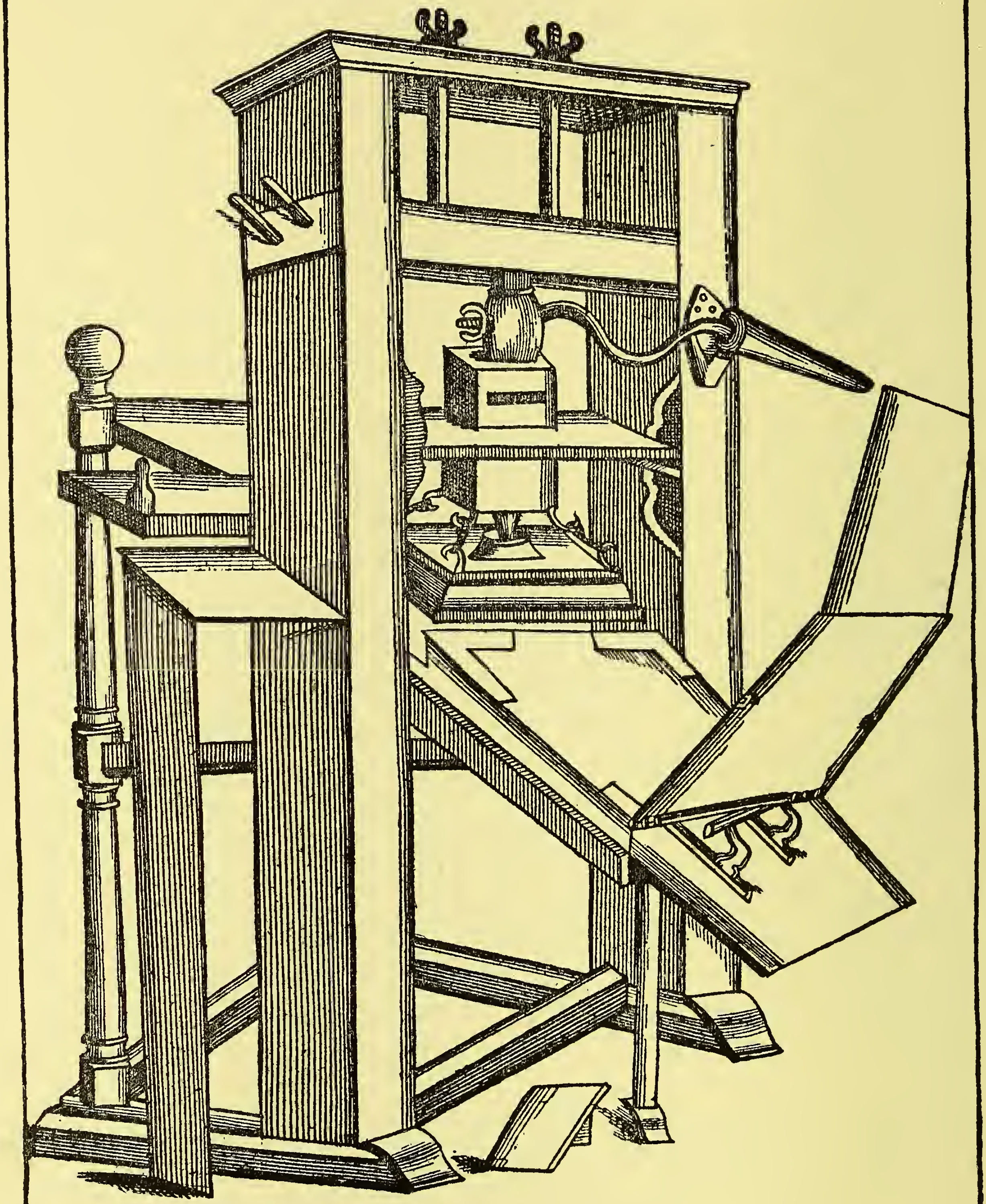
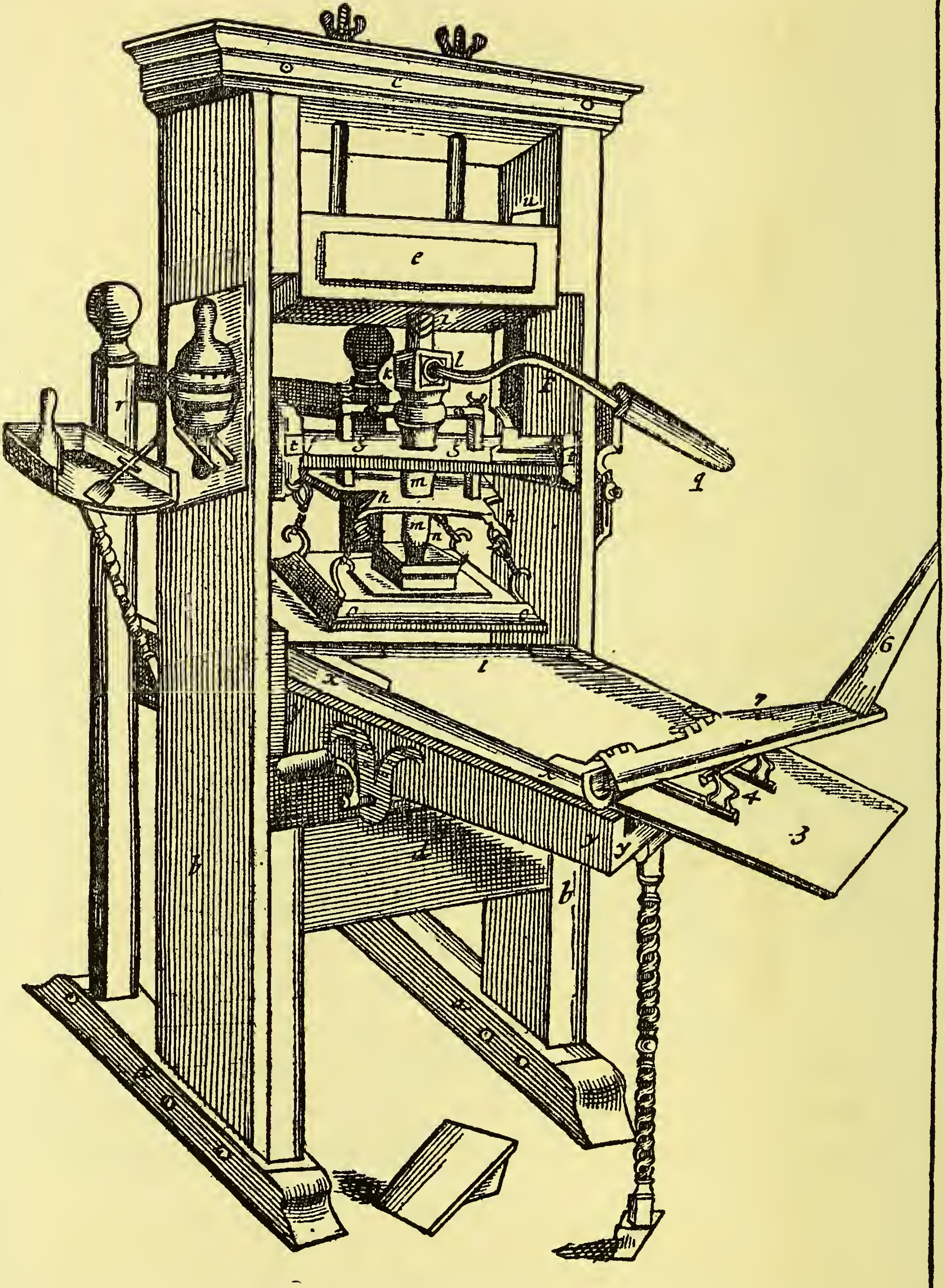


Plate 4.



MECHANICK EXERCISES:

Or, the Doctrine of

Handy-works.

Applied to the Art of

Printing.

The Second VOLUMNE.

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§. 10. *Of the* Preſs.

THere are two ſorts of *Preſſes* in uſe, *viz.* the old faſhion and the new faſhion; The old faſhion is generally uſed here in *England*; but I think for no other reaſon, than becauſe many *Preſs-men* have ſcarce Reaſon enough to diſtinguiſh between an excellently improved Invention, and a make-ſhift ſlovenly contrivance, practiced in the minority of this Art.

The New-faſhion'd *Preſſes* are uſed generally throughout all the *Low-Countries*; yet becauſe the

Old-faſhion'd *Preſſes* are uſed here in *England* (and for no other Reaſon) I have in Plate 3. given you a delineation of them; But though I give you a draft of them;yet the demenſions of every particular Member I ſhall omit, referring thoſe that think it worth their while, to the *Joyners* and *Smiths* that work to *Printers*: But I ſhall give a full deſcription of the New-faſhion'd *Preſs*, becauſe it is not well known here in *England*; and if poſſible, I would for Publick benefit introduce it.

But before I proceed, I think it not amiſs to let you know who was the Inventer of this New-faſhion'd *Preſs*, accounting my ſelf ſo much oblig'd to his Ingeniety for the curioſity of this contrivance, that ſhould I paſs by this oppertunity without nameing him, I ſhould be injurious to his Memory.

It was *Willem Janſen Blaew* of *Amſterdam*: a Man as well famous for good and great *Printing*, as for his many *Aſtronomical* and *Geographical* exhibitions to the World. In his Youth he was bred up to *Joynery*; and having learn'd his Trade, betook himſelf (according to the mode of *Holland*) to Travel, and his fortune leading him to *Denmark*, when the noble *Tycho Brahe* was about ſetting up his *Aſtronomical Obſervatory*, was entertain'd into his ſervice for the making his Mathematical-Inſtruments to Obſerve withal; in which Inſtrument-making he ſhew'd himſelf ſo intelligent and curious, that according to the general report of many of his perſonal acquaintance, all or moſt of the *Syderal Obſervations* ſet forth in *Tycho*'s name, he was intruſted to make, as well as the Inſtruments.

And before theſe Obſervations were publiſh'd to the World, *Tycho*, to gratify *Blaew*, gave him the Copies of them, with which he came away to *Amſterdam*, and betook himſelf to the making of *Globes*, according to thoſe Obſervations. But as his Trade increaſed, he found it neceſſary to deal in *Geographical Maps* and *Books* alſo, and grew ſo curious in *Engraving*, that many of his beſt *Globes* and *Maps* were *Engraved* by his own Hands; and by his converſation in *Printing* of Books at other *Printing-houſes*, got ſuch in-ſight in this Art, that he ſet up a *Printing-houſe* of his own. And now finding inconveniencies in the obſolete Invention of the *Preſs*, He contrived a remedy to every inconvenience, and fabricated nine of theſe New-faſhioned *Preſſes*, ſet them all on a row in his *Printing-houſe*, and call'd each *Preſs* by the name of one of the *Muſes*.

This ſhort Hiſtory of this excellent Man is, I confeſs forraign to my Title; But I hope my Reader will excuſe the digreſſion, conſidering it tends only to the commemoration of a Perſon that hath deſerved well of Poſterity, and whoſe worth without this ſmall Monument, might elſe perhaps have ſlid into Oblivion.

The *Preſs* is a Machine conſiſting of many Members; it is delineated in Plate 4.

a a The *Feet*.
b b The *Cheeks*.
c The *Cap*.
d The *Winter*.
e The *Head*.
f The *Till*.

g g The *Hoſe*. In the Croſs-Iron of which, encompaſſing the *Spindle*, is the *Garter*.

h h h h The *Hooks* on the *Hoſe* the *Plattin* hangs on.

i k l m n The *Spindle*.

i Part of the *Worm* below the *Head*, whoſe upper part lies in the *Nut* in the *Head*.

k l The *Eye* of the *Spindle*.

m The *Shank* of the *Spindle*.

n The *Toe* of the *Spindle*.

o o o o The *Plattin* tyed on the *Hooks* of the *Hoſe*.

p The *Bar*.

q The *Handle* of the *Bar*

r r The *Hind-Poſts*.

s s The *Hind-Rails*.

t t The *Wedges* of the *Till*.

u u The *Morteſſes* of the *Cheeks*, in which the *Tennants* of the *Head* plays.

x x x x y y The *Carriage*.

x x x x The outer *Frame* of the *Carriage*.

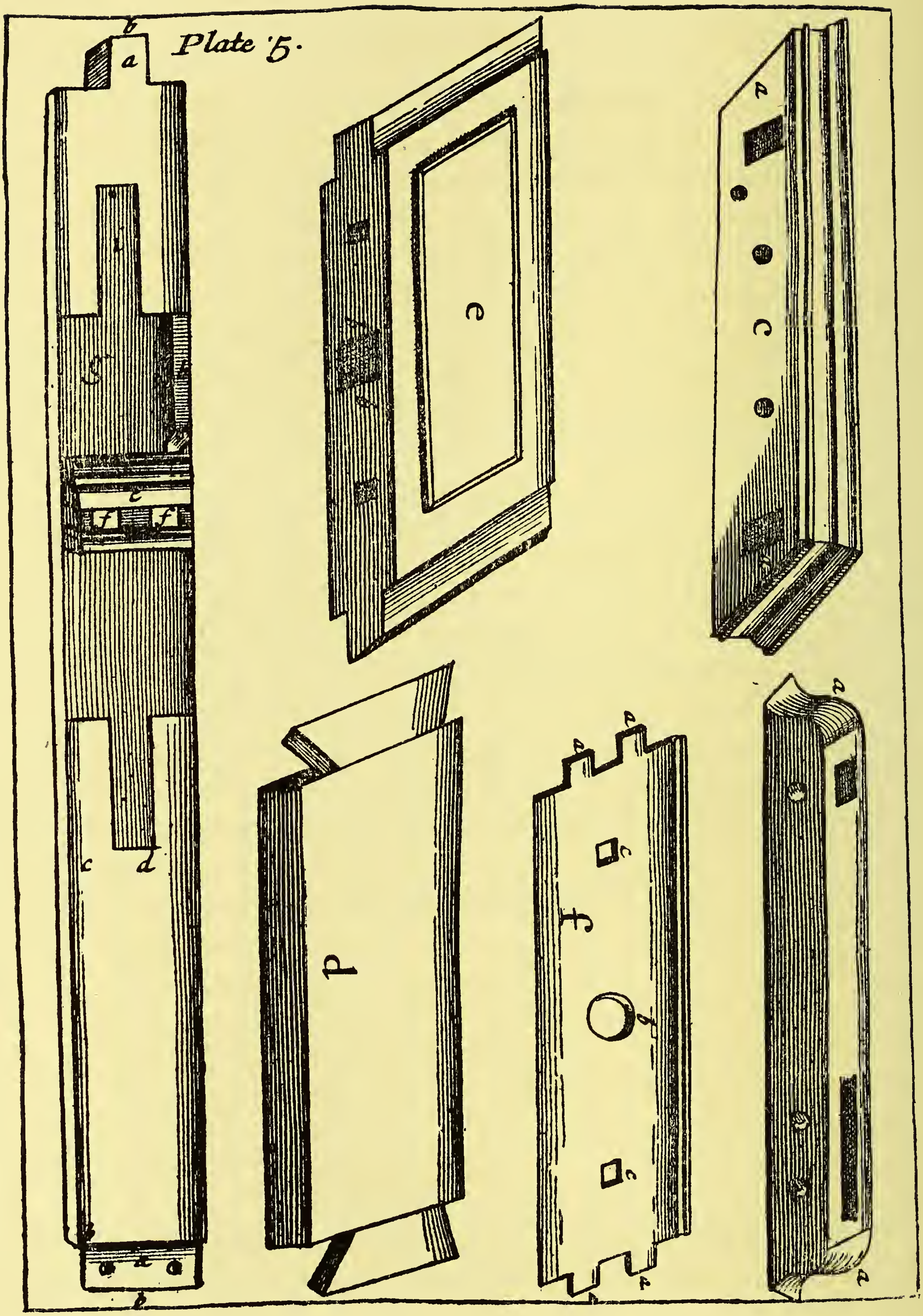
y y The *Wooden-Ribs* on which the *Iron-Ribs* are faſtned.

z The *Stay* of the *Carriage*, or the *Stay*.

1. The *Coffin*.
2. The *Gutter*.
3. The *Planck*.
4. The *Gallows*.
5. The *Tinpans*.
6. The *Frisket*.
7. The *Points*.
8. The *Point-Screws*.

All theſe ſeveral Members, by their Matter, Form and Poſition, do particularly contribute ſuch an aſ-

Plate 5.



ſiſtance to the whole Machine, that it becomes an Engine managable and proper for its intended purpoſe.

But becauſe the ſmallneſs of this altogether-Draft may obſcure the plain appearance of many of theſe Parts; Therefore I ſhall give you a more particular deſcription, and large delineation of every Member in the *Preſs*: And firſt of the Wooden work: Where, *Note*, that all the Fram'd Wooden-work of a *Preſs* is made of Good, Fine, Clean, Well-ſeaſon'd *Oak*.

¶. 1. *Of the* Feet.

The *Feet* (marked *a a* in Plate 5.) are two Foot nine Inches and an half long, five Inches deep; and ſix Inches broad, and have their out-ſides Tryed to a true ſquare, as was taught, *Numb.* 5. §. 15. It hath (for ornament ſake) its two ends bevil'd away in a Molding, from its upper-ſide to its lower, about four Inches within the ends; about four Inches and three quarters within each end of each Foot is made in the middle of the Breadth of the upper-ſide of the Foot a Morteſs two Inches wide, to receive the *Tennants* of the lower-end of the *Cheek*, and the *Tennant* of the lower end of the *Hind-Poſt*: The Morteſs for the *Cheek* is eight Inches long, *viz.* the Breadth of the *Cheek*: And the Morteſs for the Hind-Poſt is four Inches long, *viz.* the ſquare of the *Hind-Poſt*.

¶. 2. *Of the* Cheeks.

The *Cheeks* (marked *b b* in Plate 5) are five Foot and ten Inches long (beſides the *Tennants* of the top and bottom) eight Inches broad, and four Inches and an half thick. All its Sides are tryed ſquare to one another. It hath a *Tennant* at either end, its lower *Tennant* marked *a* to enter the Fore-end of the Foot, runs through the middle of the Breadth of the *Cheek*, which therefore is made to fit the Morteſs in the *Foot*, and is about four Inches long, and therefore reaches within an Inch of the bottom of the *Foot*; But the *Tennant* at the upper end of the *Cheek* marked *a*, is cut a-thwart the breadth of the *Cheek*, and therefore can have but four Inches and an half of Breadth, and its thickneſs is two Inches, Its length is four Inches; ſo that it reaches into the Morteſs in the *Cap*, within half an Inch of the Top.

In the lower-end-*Tennant* is two holes bored, within an Inch and an half of either ſide, and within an Inch and an half of the Sholder, with a three quarter Inch *Augure*, to be pin'd into the *Feet* with an Iron Pin.

In the middle of the upper *Tennant*, and within an Inch and an half of the Sholder, is bored another hole, to Pin the *Tennant* into the *Cap*, alſo with an Iron Pin.

Between *b c* two Foot and half an Inch, and three Foot ſeven Inches of the Bottom Sholder of the *Tennant*, *viz.* from the top of the *Winter* to the under Sholder the *Till* reſts upon, is cut flat away into the thickneſs of the *Cheek*, three Inches in the Inſide of the *Cheek*; ſo that in that place the *Cheek* remains but an Inch and an half thick: And the *Cheeks* are thus widened in this place, as well becauſe the Duſtail *Tennants* of the *Winter* may go in between them, as alſo ſo that the *Carriage* and *Coffin* may be made the wider

Even with the lower Sholder of this flat cutting-in, is made a Duſtail Morteſs as at *d*, to reach eight Inches and an half, *viz.* the depth of the *Winter* below the ſaid Sholder. This Morteſs is three Inches wide on the inſide the *Cheek*, and three Inches deep; But towards the inſide the *Cheek*, the Morteſs widens in a ſtraight line from the ſaid three Inches to five Inches, and ſo becomes a Duſtail Morteſs. Into this Duſtail Morteſs is fitted a Duſtail *Tennant*, made at each end of the *Winter*.

Two Inches above the aforeſaid Cutting-in, is another cutting-in of the ſame depth, from the Inſide the *Cheek* as at *e*. This cutting-in is but one Inch broad at the farther ſide the *Cheek*, and an Inch and a quarter on the hither ſide the *Cheek*. The under ſide of this Cutting-in, is ſtraight through the *Cheek*, *viz.* Square to the ſides of the *Cheek*: But the upper ſide of this Cutting-in, is not ſquare through the *Cheeks*, But (as aforeſaid) is one quarter of an Inch higher on the fore-ſide the *Cheek* than it is on the further ſide; So that a Wedge of an Inch at one end, and an Inch and a quarter at the other end may fill this Cutting-in.

At an Inch within either ſide the *Cheek*, and an Inch below this Cutting-in, as at *f f*, is made a ſmall Morteſs an Inch and an half wide, to which two *Tennants* muſt be fitted at the ends of the *Till*, ſo that the *Tennants* of the *Till* being ſlid in through the Cutting-in aforeſaid, may fall into theſe Morteſſes, and a Wedge being made fit to the Cutting-in, may preſs upon the *Tennants* of the *Till*, and force it down to keep it ſteddy in its place.

Here we ſee remains a ſquare Sholder or ſubſtance of Wood between two Cuttings-in ; But the under corner of this ſquare Sholder is for Ornament-ſake Bevil'd away and wrought into an *Ogee.*

At two Inches above the laſt Cutting-in, is another Cutting-in, but this Cutting-in goes not quite through the breadth of the *Cheek,* but ſtops at an Inch and an half within the further ſide the *Cheek* ; So that above the *Till* and its *Wedge* is another Sholder or ſubſtance of Wood, whoſe upper Corner is alſo Bevil'd away, and wrought to a Molding as the former.

The laſt Cutting-in is marked *g*, and is eight Inches and a quarter above the Sholder of the *Till,* that it may eaſily contain the depth of the *Head*; The ſubſtance remaining is marked *h.* This Cutting-in is made as deep into the thickneſs of the *Cheek* as the former Cuttings-in are, *viz.* three Inches ; and the reaſon the *Cheek* is cut-in here, is, that the *Cheeks* may be wide enough in this place to receive the *Head,* and its *Tennants,* without un-doing the *Cap* and *Winter.*

Juſt above this Cutting-in is made a ſquare Morteſs in the middle of the *Cheek,* as at *i,* it is eight Inches long, and two Inches and an half wide, for the *Tennant* of the *Head* to play in.

Upon the fore-ſide of the *Cheek* is (for Ornament ſake) laid a Molding through the whole length of the *Cheek* (a ſquare at the Top and Bottom an Inch deep excepted) it is laid on the outer ſide, and therefore can be but an Inch broad ; Becauſe the Cuttings-in on the inſide leaves the ſubſtance of Stuff but an

Inch and an half thick, and ſhould the Moldings be made broader, it would be interrupted in the ſeveral Cuttings in, or elſe a ſquare of a quarter of an Inch on either ſide the Molding could not be allowed, which would be ungraceful.

¶. 3. *Of the* Cap *marked* c *in Plate* 5.

The *Cap* is three Eoot and one Inch long, four Inches and an half deep, and nine Inches and an half broad; But its fore-ſide is cut away underneath to eight Inches, *Viz* the breadth of the *Cheeks*. Three quarters of an Inch above the bottom of the *Cap*, is a ſmall *Facia*, which ſtands even with the thickneſs of the *Cheeks*; Half an Inch above that a Bead-Molding, projecting half an Inch over the *Facia*. Two Inches above that a broad *Facia*, alſo even with the thickneſs of the *Cheeks*; and an Inch and a quarter above that is the upper Molding made projecting an Inch and an half over the two *Facia*'s aforeſaid, and the thickneſs of the *Cheeks*.

Each end of the *Cap* projects three Inches quarter and half quarter over the *Cheeks*, partly for Ornament, but more eſpecially that ſubſtance may be left on either end beyond the Morteſſes in the *Cap*; and theſe two ends have the ſame Molding laid on them that the fore-ſide of the *Cap* hath.

Within two Inches and half quarter of either end on the under-ſide the *Cap* is made a ſquare Morteſs two Inches wide, and four Inches and an half long, *viz.* the thickneſs of the *Cheek* inwards, as at *a a*, to receive the Top *Tennants* of the *Cheeks*; which Top

Tennants are with an Iron Pin(made tapering of about three quarters of an Inch thick) pin'd into the Morteſs of the *Cap*, to keep the *Cheeks* ſteddy in their poſition.

¶. 4. *Of the* Winter *marked* d *in* Plate 5.

The Length of the *Winter* beſides the *Tennants*, is one Foot nine Inches and one quarter of an Inch; The Breadth of the *Winter* eight Inches, *viz.* the Breadth of the *Cheek*, and its depth nine Inches; all its ſides are tryed ſquare; But its two ends hath each a Duſtail-*Tennant* made through the whole depth of the *Winter*, to fit and fall into the Duſtail Morteſſes made in the *Cheeks*: Theſe Duſtail-*Tennants* are intended to do the Office of a *Summer*, Becauſe the ſpreading of the ends of theſe two *Tennants* into the ſpreading of the Morteſſes in the *Cheeks*, keeps the two *Cheeks* in a due diſtance, and hinders them from flying aſſunder.

But yet I think it very convenient to have a *Summer* alſo, the more firmly and ſurer to keep the *Cheeks* together; This *Summer* is only a Rail *Tennanted*, and let into Morteſſes made in the inſide of the *Cheeks*, and Screwed to them as the Rails deſcribed, *Numb.* 15. §. 4. are Screwed into the Stiles of the *Caſe-Frame*; Its depth four Inches and an half, and its breadth eight Inches, *viz*, the breadth of the *Cheeks*.

¶. 5. *Of*

¶. 5. *Of the* Head *marked* e *in* Plate 5.

The length of the *Head* beſides the *Tennant* at either end, is one Foot nine Inches and one quarter of an Inch ; The breadth eight Inches and an half, and its depth eight Inches. The Top, Bottom and Hind-ſides are tryed Square, but the foreſide projects half an Inch over the Range of the fore-ſides of the *Cheeks*; in which Projecture is cut a Table with a hollow Molding about it, two Inches diſtant from all the ſides of the fore-ſide of the *Head* : Its *Tennants* are three Inches Broad, and are cut down at either end, from the top to the bottom of the *Head*, and made fit to the Morteſſes in the *Cheeks*, that they may ſlide tight, and yet play in them.

In the under-ſide of the *Head* is cut a ſquare Hole, (as at *a*,) about four Inches ſquare, and three Inches and an half deep, into which the *Braſs-Nut* is to be fitted : And to keep this *Nut* in its place (leſt the weight of it ſhould make it fall out) is made on either ſide the ſquare hole, at about half an Inch diſtance from it, (as at *b b*) a ſquare Hole quite through the Top and Bottom of the *Head* about three quarters of an Inch wide ; and into this ſquare Hole is fitted a ſquare piece of Iron to reach quite through the *Head*, having at its under-end a Hook turned ſquare to clapſe upon the under-ſide of the *Nut* ; and on its upper-end a Male-Screw reaching about an Inch above the upper-ſide of the *Head*, which by the help of a Female-ſcrew made in an Iron *Nut*, with Ears to it to turn it about draws the *Claſp* at the bottom of the Iron *Shank* cloſe againſt the *Nut*, and ſo keeps it from falling out.

In the middle of the wide ſquare Hole that the *Nut* is let into, is bored a round Hole through the top of the *Head*, of about three quarters of an Inch wide, for the *Preſs-man* to pour *Oyl* in at ſo oft as the *Nut* and *Spindle* ſhall want *Oyling*.

At three Inches from either end of the *Head* (as at *cc*) is bored a Hole quite through the top and bottom of the *Head*, which holes have their under ends ſquar'd about two Inches upwards,and theſe ſquares are made ſo wide as to receive a ſquare Bar of Iron three quarters of an Inch ſquare;But the other part of theſe Holes remain round: Into theſe Holes two Irons are fitted called the *Screws*.

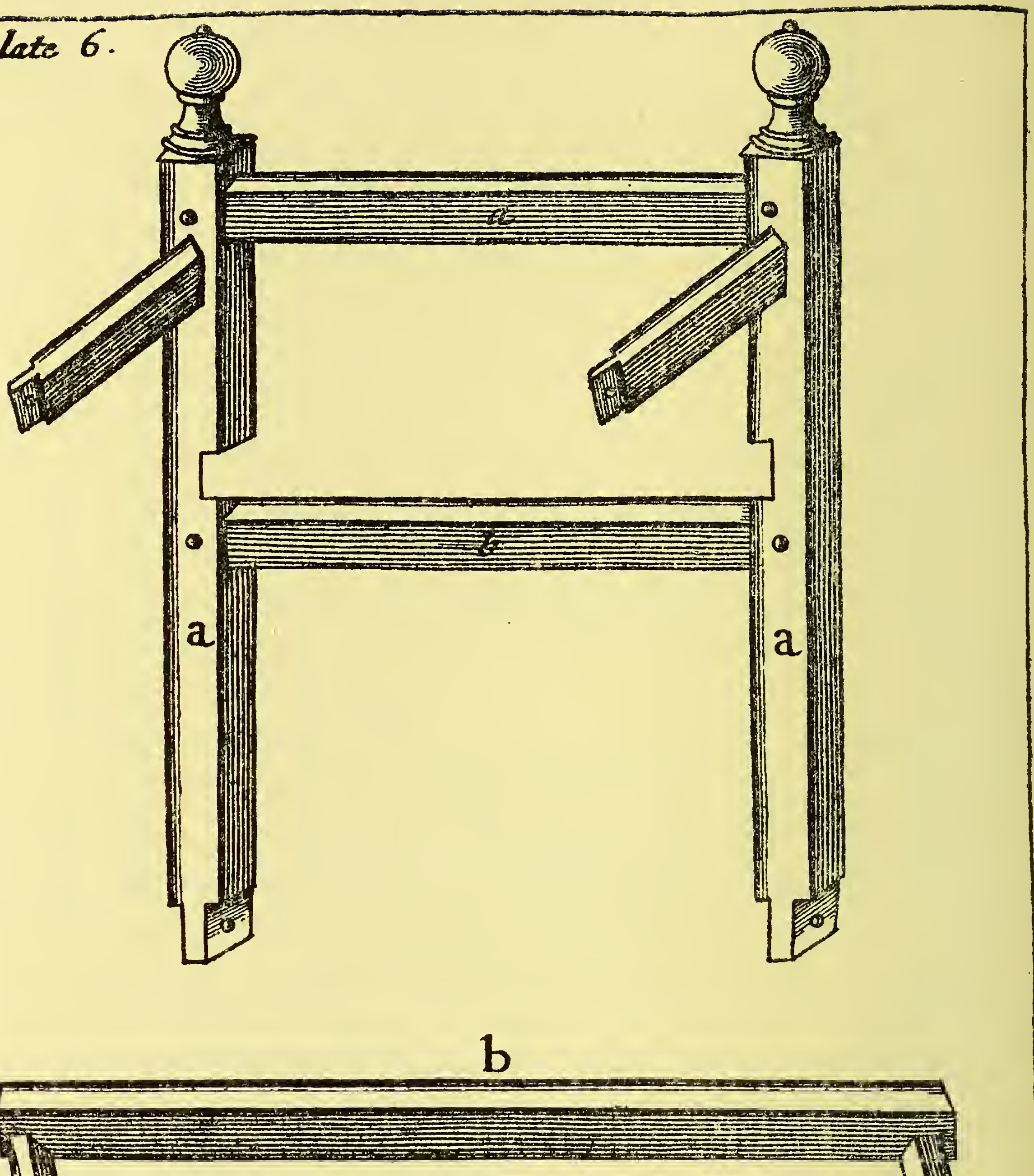
The Shanks of theſe *Screws* are made ſo long as to reach through the *Head* and through the *Cap*: At the upper-end of theſe Shanks is made Male-ſcrews, and to theſe Male-ſcrews, Iron Female-ſcrews are fitted with two Ears to twiſt them the eaſier about

So much of theſe Iron Shanks as are to lye in the ſquare Hole of the *Head* aforeſaid, are alſo ſquared to fit thoſe ſquare Holes, that when they are fitted and put into the Holes in the *Head*; they may not twiſt about.

To the lower-ends of theſe Iron-Shanks are made two Square, Flat Heads, which are let into and buried in the under-ſide of the *Head*; And upon the Sholders of thoſe two Flat Heads, reſts the weight of the *Head* of the *Preſs*; And by the *Screws* at the Upper end of the Shanks are hung upon the upper-ſide of the *Cap*, and Screwed up or let down as occaſion requires.

¶. 6. *Of*

Plate 6.



¶. 6. *Of the* Till, *marked* f *in* Plate 5.

The *Till* is a Board about one Inch thick, and is as the *Head* and *Winter*, one Foot nine Inches and a quarter long, beſides the *Tennants* at either end; Its Breadth is the Breadth of the *Cheeks*, *viz.* eight Inches; It hath two *Tennants* at either end as at *a a a a*, each of them about an Inch and an half long, and an Inch and an half broad, and are made at an Inch diſtance from the fore and Back-ſide, ſo that a ſpace of two Inches is contained in the middle of the ends between the two *Tennants*; theſe *Tennants* are to be laid in the Morteſſes in the *Cheeks* delineated at *f f* in Plate 5 and deſcribed in this §. 10. ¶. 2.

In its middle it hath a round Hole about two Inches and an half wide, as at *b*, for the Shank of the *Spindle* to paſs through.

At ſeven Inches and a quarter from either end, and in the middle between the Fore and Back-ſide, is made two ſquare Holes through the *Till*, as at *c c*, for the Iron *Hoſe* to paſs through.

¶. 7. *Of the* Hind-Poſts *marked* a a *in* Plate 6.

At one Foot diſtance from the Hind-ſides of the *Cheeks* are placed upright to *Hind-Poſts*-, they are three Foot and four Inches long beſides the *Tennants*, which *Tennants* are to be placed in the Morteſſes in the hinder ends of the *Feet*; Their thickneſs is four Inches on every ſide, and every ſide is tryed ſquare;

But within eight Inches of the top is turned a round Ball with a Button on it, and a Neck under it, and under that Neck a ſtraight Plinth or Baſe: This turn'd work on the top is only for Ornament ſake.

There are ſix *Rails* fitted into theſe *Hind-Poſts*, two behind marked *a b*, one of them ſtanding with its upper ſide at two Inches below the turned Work, the other having its upper-ſide lying level with the upper-ſide of the *Winter.*

Theſe two *Rails* are each of them *Tennanted* at either end, and are made ſo long, that the out-ſides of the *Hind-Poſts* may ſtand Range or even with the outer-ſides of the *Cheeks*; Theſe *Tennants* at either end are let into Morteſſes made in the in-ſides of the *Hind-Poſts*, and Pin'd up with half Inch wooden Pins, Glewed in, as was ſhewn Vol. 1. *Numb.* 5. §. 17. Becauſe the two *Hind-Poſts* need not be ſeparated for any alteration of the *Preſs.*

The two *Side-Rails* on either ſide the *Preſs* are *Tennanted* at each end, and let into Morteſſes made in the *Cheeks* and *Hind-Poſts*, ſo as they may ſtand Range with the outer-ſides of the *Cheeks* and *Hind-Poſts*; But the *Tennants* that enter the Morteſſes in the *Cheeks* are not pin'd in with Wooden Pins, and Glewed; becauſe they may be taken aſſunder if need be; But are Pin'd in with Iron Pins, made a little tapering towards the entring end, ſo as they may be driven back when occaſion ſerves to alter the *Preſs*: And the *Tennants* that enter the Morteſſes in the *Hind-Poſts* are faſtned in by a Female-ſcrew, let in near the end of the *Rail*, which receives a Male-ſcrew thruſt through the *Hind Poſts*, even as I ſhew'd in

§. 4. the *Fore* and *Back-Rails* of the *Caſe-Frame*; was.

¶. 8. *Of the* Ribs *marked* b *in* Plate 6.

The *Ribs* lye within a Frame of four Foot five Inches long, one Foot eleven Inches broad; its two *End-Rails* one Inch and an half thick, its *Side-Rails* two Inches and an half thick; and the breadth of the *Side* and *End-Rails* two Inches and an half. But the *Side-Rails* are cut away in the in-ſide an Inch and an half towards the outer ſides of the *Rails*, and an Inch deep towards the Bottom ſides of the *Rails*, ſo that a ſquare *Cheek* on either *Side-Rail* remains. This cutting down of the *Outer-Rails* of the *Frame* is made, becauſe the Planck of the *Carriage* being but one Foot eight Inches an an half broad, may eaſily ſlide, and yet be gaged between theſe *Cheeks* of the *Rail*, that the *Cramp-Irons* Nailed under the *Carriage Planck* joggle not on either ſide off the *Ribs*, as ſhall more fully be ſhewn in the next §.

Between the two *Side Rails* are framed into the two *End-Rails* the two *Wooden-Ribs* two Inches and an half broad, and an Inch and an half thick; they are placed each at an equal diſtance from each *Side-Rail*, and alſo at the ſame diſtance between themſelves. Upon theſe two *Ribs* are faſt Nailed down the *Iron-Ribs*, of which more ſhall be ſaid when I come to ſpeak of the Iron-work.

¶. 9. *Of the* Carriage, Coffin *and its* Planck, *marked* a *in* Plate 7.

The *Planck* of the *Carriage* is an Elm-Planck an Inch and an half thick, four Foot long, and one Foot eight Inches and three quarters broad; upon this *Planck* at its fore-end is firmly Nailed down a ſquare Frame two Foot four Inches long, one Foot ten Inches broad, and the thickneſs of its Sides two Inches and an half ſquare: This Frame is called the *Coffin*, and in it the *Stone* is *Bedded.*

Upon each of the four Corners of this *Coffin* is let in and faſtned down a ſquare Iron Plate as at *a a a a*, with Return-Sides about ſix Inches long each ſide, half a quarter of an Inch thick, and two Inches and a quarter broad; upon the upper outer-ſides of each of theſe Plates is faſtned down to them with two or three Rivets through each ſide, another ſtrong Iron half an Inch deep, and whoſe outer Angles only are ſquare, but the Inner Angles are obtuſe, as being ſloped away from the Inner-Angle towards the farther-end of each inner-ſide, ſo as the *Quoins* may do the Office of a Wedge between each inner-ſide and the *Chaſe*.

The Plates of theſe Corners (as I ſaid) are let in on the outer-Angles of the upper-ſide of the Frame of the *Coffin*, ſo as the upper-ſides of the Plates lye even with it, and are Nailed down, or indeed rather Rivetted down through the bottom and top-ſides of the Frame of the *Coffin*, becauſe then the upper-ſides of the Holes in the Iron Plates being ſquare

Bored (that is, made wider on the upper ſide of the Plate, as I ſhall ſhew when I come to the making of *Mathematical Inſtruments*) the ends of the Shanks of the Iron Pins may be ſo battered into the Square-boring, that the whole Superficies of the Plate when thus Rivetted ſhall be ſmooth, which elſe with the exturberancies of Nail-heads would hinder the free ſliding of the *Quoins*.

At the hinder end of the Frame of the *Coffin* are faſtned either with ſtrong Nails, Rivets, or rather Screws, two Iron *Half-Joynts*, as at *b b*, which having an Iron Pin of almoſt half an Inch over put through them, and two *Match half-Joynts* faſtned on the Frame of the *Tympan*, theſe two *Match-half-Joynts* moving upon the Iron Pin aforeſaid, as on an *Axis*, keeps the *Tinpan* ſo truly gaged, that it always falls down upon the *Form* in the place, and ſo keeps *Regiſter* good, as ſhall further be ſhewed in proper place.

Behind the *Coffin* is Nailed on to its outſide, a Quarter, as at *c c* this Quarter is about three Inches longer than the breadth of the *Coffin*, it hath all its ſides two Inches over, and three of them ſquare; but its upper ſide is hollowed round to a Groove or Gutter an Inch and an half over. This Gutter is ſo Nailed on, that its hither end ſtanding about an Inch higher than its further end, the Water that deſcends from the *Tympan* falling into it is carried away on the farther ſide the *Coffin* by the declivity of the farther end of the Gutter, and ſo keeps the Planck of the *Carriage* neat and cleanly, and preſerves it from rotting.

Parallel to the outer ſides of the hind part of the Planck of the *Carriage*, at three Inches diſtance from either ſide, is Nailed down on the upper ſide of the Planck two Female-Duſtail Grooves, into which is fitted (ſo as they may ſlide) two Male-Duſtails made on the two Feet of the *Gallows* (as at *d d*) that the *Tinpan* reſts upon; and by the ſliding forward or backward of theſe Duſtail Feet, the heighth of the *Tinpan* is raiſed or depreſſed according to the Reaſon or Fancy of the *Preſs-man*.

At three Inches from the hinder Rail of the *Coffin*, in the middle, between both ſides of the Planck, is cut an Hole four Inches ſquare (as at *e e*) and upon the hither and farther ſide of this Hole is faſtned down on each ſide a *Stud* made of Wood (as at *f f*) and in the middle of theſe two *Studs* is made a round Hole about half an Inch over, to receive the two round ends of an Iron Pin; which Iron Pin, though its ends be round, is through the middle of the Shank ſquare, and upon that ſquare is fitted a round *Wooden-Rowler* or *Barrel*, with a Shoulder on either ſide it, to contain ſo much of the *Girt* as ſhall be rowled upon it; And to one end of the *Rowler* is faſtned an Iron *Circle* or *Wheel*, having on its edge *Teeth* cut to ſtop againſt a *Clicker*, when the *Rowler* with an Iron Pin is turned about to ſtrain the *Girt*.

¶. 10. *Of the* Tympan *and* Inner-Tympan, *marked* b *in* Plate 7.

The *Tympan* is a ſquare Frame, three ſides whereof are Wood, and the fourth Iron. Its width is one

Foot eight Inches, its length two Foot two Inches; the breadth of the wooden Sides an Inch and an half, and the depth one Inch.

On its ſhort Wooden-ſide, *viz.* its Hind-end, at the two Corners is Rivetted an Iron *Match-Joynt*, to be pinned on to another *Half joynt* faſtned on the *Hind Rail* of the *Coffin.*

The other end, *viz.* the Fore-end of the *Tympan* is made of Iron, with a ſquare *Socket* at either end for the Wooden ends of the *Tympan* to fit and faſten into. This Iron is ſomewhat thinner and narrower than an ordinary Window-Caſement.

Upon the outer edge of this Iron, about an Inch and an half off the ends of it, is made two Iron *Half-joynts* to contain a Pin of about a quarter of an Inch over, which Pin entring this *half-joynt*, and a *match Half-joynt* made upon the *Frisket*, ſerves for the *Frisket* to move truly upon.

In the middle of each long *Rail* of the *Tympan*, is made through the top and bottom an Hole half an Inch ſquare, for the ſquare Shanks of the *Point-Screws* to fit into.

The like Holes are alſo made in the *Tympan*, at one third part of its length from the Fore-end or *Frisket-joynt*, to place the *Point Screws* in; when a *Twelves*, *Eighteens*, &c. is wrought.

Into the Inner-ſide of this *Tympan* is fitted the *Inner-Tympan*, whoſe three ſides are alſo made of Wood, and its fourth ſide of Iron, as the *Tympan*, but without *joynts*; it is made ſo much ſhorter than the *Outer-Tympan*, that the outer edge of the Iron of the *Inner-Tympan* may lye within the inner edge of the Iron on the *Outer-Tympan*;

pan ; and it is made ſo much narrower than the inſide of the *Tympan*, that a convenient room may be allowed to paſte a *Vellom* betwen the inſide of the *Tympan*, and the outſide of the *Inner-Tympan*.

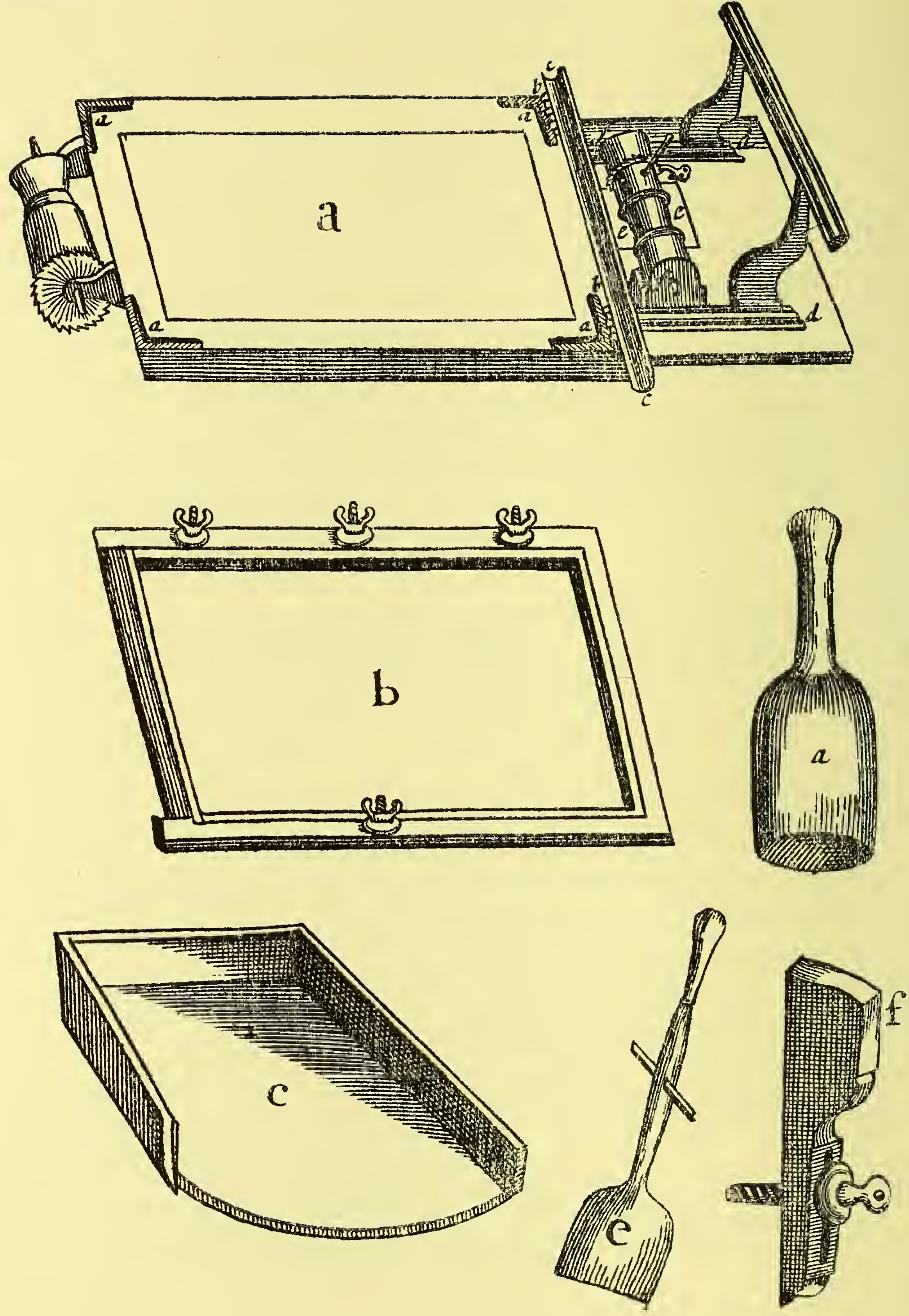
About the middle, through the hither-ſide of the *Inner Tympan*, is let in and faſtned an Iron Pin about a quarter of an Inch over, and ſtands out three quarters of an Inch upon the hither out-ſide of the *Inner-Tympan*, which three quarters of an Inch Pin fits into a round hole made in the inner-ſide of the *Tympan*, to gage and fit the *Inner-Tympan* right into the *Tympan* ; for then by the help of an Iron turning *Claſp* on the further ſide the *Tympan*, the *Inner-Tympan* is kept firmly down and in its poſition.

¶. 11. *Of the* Inck-Block, Slice, Brayer, *and* Catch *of the* Bar, *marked* c d e f in Plate 7.

To the *Rail* between the hither *Cheek* and *Hind-Poſt* is faſtned the *Inck-Block*, which is a Beechen-board about thirteen Inches long, nine Inches broad, and commonly about two Inches thick , and hath the left hand outer corner of it cut away; it is Railed in on its farther and hinder-ſides, and a little above half the hither-ſide, with Wainſcot-Board about three quarters of an Inch thick, and two Inches and an half above the upper-ſide the board of the *Inck-Block*. It is deſcribed in Plate 7. at c.

The *Brayer* marked *a* is made of *Beech*: It is turned round on the ſides, and flat on the bottom, its length is

Plate 7



is about three Inches, and its diameter about two Inches and an half; it hath an Handle to it about four Inches long. Its Office is to rub and mingle the *Inck* on the *Inck-Block* well together.

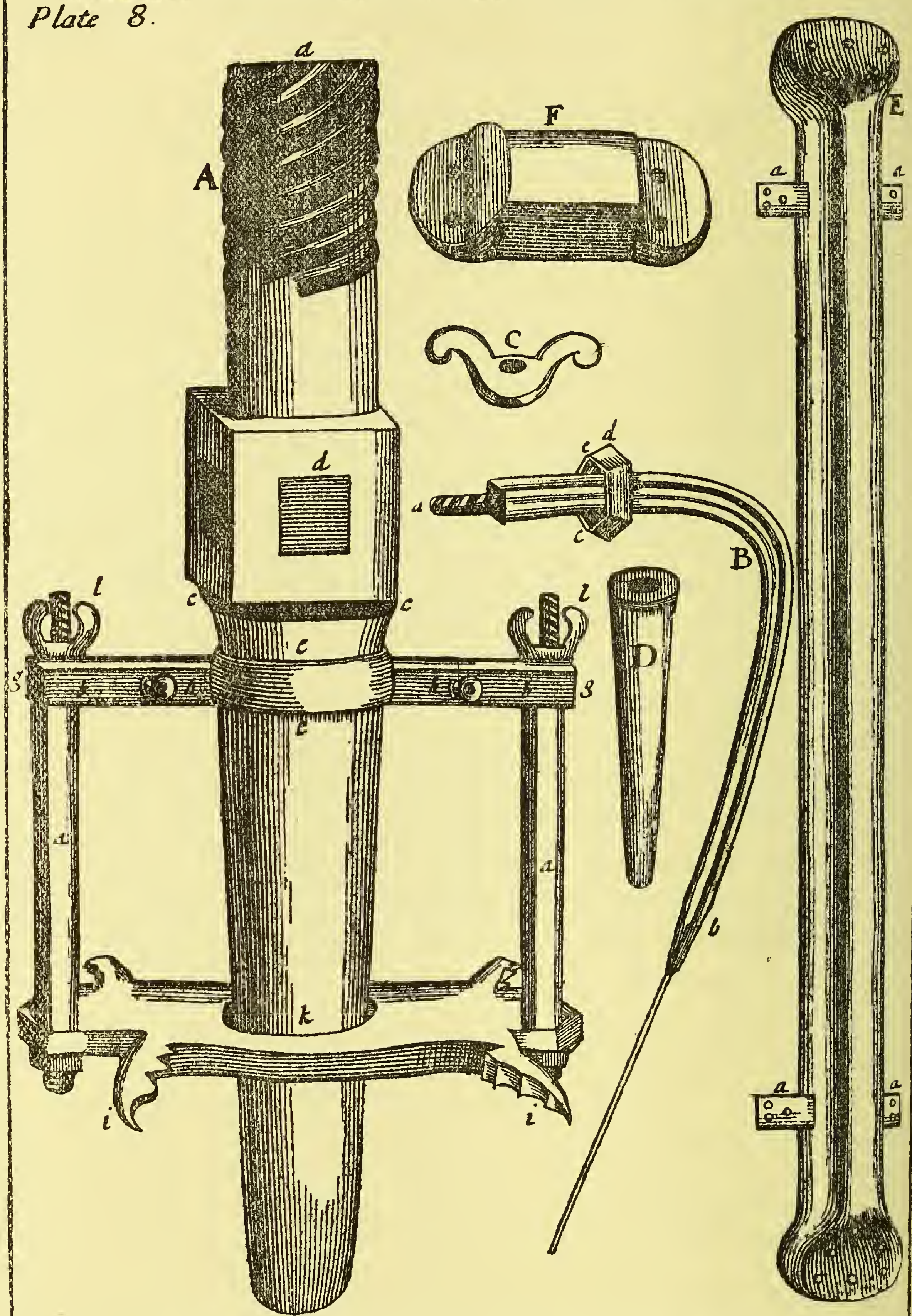
The *Slice* is a little thin Iron *Shovel* about three or four Inches broad, and five Inches long; it hath an Handle to it of about ſeven Inches long. Near the *Shovel* through the Handle is fitted a ſmall Iron of about two Inches long ſtanding Perpendicular to both the ſides of the Handle, and is about the thickneſs of a ſmall Curtain-Rod. It is deſcribed at e.

The *Catch* of the *Bar* deſcribed at f is a piece of Wood two Inches thick, four Inches broad, and ten Inches long; The top of it is a little Bevil'd or Slop'd off, that the *Bar* may by its *Spring* fly up the Bevil till it ſtick. This Bevil projects three Inches over its ſtraight Shank, which reaches down to the bottom; in the middle of this Shank, through the fore and back-ſide, is a Morteſs made from within an Inch of the Rounding to an Inch and an half of the bottom; This Morteſs is three quarters of an Inch wide, and hath an Iron Pin with a Shoulder at one end fitted to it, ſo as it may ſlide from one end of the Morteſs to the other. At the other end of the Iron Pin is made a Male-Screw which enters into a Female Iron Screw let into the further *Cheek* of the *Preſs*; ſo that the *Catch* may be Screwed cloſe to the *Cheek*, as ſhall further be ſpoken to hereafter.

¶. 12. *Of the Iron-work, and firſt of the* Spindle *marked* A *in Plate* 8.

From the Top to the *Toe* of the *Spindle*, *viz*. from *a* to *b* is ſixteen Inches and a half, the length of the Cilinder the *Worms* are cut upon is three Inches and a quarter, and the diameter of that Cilinder two Inches and a quarter; between the bottom of the *Worms* and top of the Cube one Inch and an half; the Cube marked *c c c c* is two Inches and three quarters, the ſquare *Eye* at *d* in the middle of the Cube is an Inch and a quarter through all the ſides of the Cube; one Inch under the Cube at *e* is the *Neck* of the *Spindle*, whoſe diameter is two Inches, It is one Inch between the two ſhoulders, *viz*. the upper and under ſhoulders of the *Neck* at *e e*, ſo that the Cilinder of the *Neck* is one Inch long; the very bottom of the *Spindle* at *b* is called the *Toe*, it is made of an Hemiſpherical form, and about one Inch in diameter; This *Toe* ſhould be made of *Steel*, and well Temper'd, that by long or careleſs uſage, the point of preſſure wear not towards one ſide of the *Toe*, but may remain in the Axis of the *Spindle*.

Plate 8.



§. 11. *Of the* Worms *of the* Spindle.

I promiſed at the latter end of *Numb.* 2. to give a more copious account than there I did of making *Worms*, when I came to exerciſe upon *Printing-Preſs Spindles*; and being now arrived to it, I ſhall here make good my promiſe.

¶. 1. The *Worms* for *Printing-Preſs Spindles* muſt be projected with ſuch a declivity, as that they may come down at an aſſigned progreſs of the *Bar*.

The aſſigned progreſs may be various, and yet the *Spindle* do its office: For if the *Cheeks* of the *Preſs* ſtand wide aſſunder, the ſweep or progreſs of the ſame *Bar* will be greater than if they ſtand nearer together.

It is confirm'd upon good conſideration and Reaſon as well as conſtant experience, that in a whole Revolution of the *Spindle*, in the *Nut*, the *Toe* does and ought to come down two Inches and an half; but the *Spindle* in work ſeldom makes above one quarter of a Revolution at one *Pull*, in which ſweep it comes down but half an Inch and half a quarter of an Inch; and the reaſon to be given for this coming down, is the ſqueezing of the ſeveral parts in the *Preſs*, ſubject to ſqueeze between the Morteſſes of the *Winter* and the Morteſſes the *Head* works in; and every Joynt between theſe are ſubject to ſqueeze by the force of a *Pull*. As firſt, The *Winter* may ſqueeze down into its Morteſs one third part of the thickneſs of a *Scabbord*. (Allowing a *Scabbord* to be half a *Nomparel* thick.) Secondly, The *Ribs* ſqueeze cloſer to the *Winter* one *Scabbord.* Thirdly, The *Iron-Ribs* to the Wooden *Ribs* one *Scabbord.* Fourthly, The *Cramp-Irons* to the *Planck* of the *Coffin* one *Scabbord.* Fifthly, The *Planck* it ſelf half a *Scabbord.* Sixthly; The *Stone* to the *Planck* one *Scabbord.* Seventhly, The *Form* to the *Stone* half a *Scabbord.* Eighthly, The *Juſtifyers* in the Morteſs of the *Head* three *Scabbords.* Ninthly, The *Nut* in the *Head* one *Scabbord.* Tenthly, The *Paper*, *Tympans* and *Blankets* two *Scabbords.* Eleventhly, Play for the Irons of the *Tympans* four *Scabbords.* Altogether make fifteen *Scabbords* and one third part of a *Scabbord* thick, which (as aforeſaid) by allowing two *Scabbords* to make a *Nomparel*, and as I ſhewed in *Vol.* 2. *Numb* 2. §. 2. One hundred and fifty *Nomparels* to make one Foot, gives twelve and an half *Nomparels* for an Inch, and conſequently twenty five *Scabbords* for an Inch; ſo by proportion, fifteen *Scabbords* and one third part of a *Scabbord,* gives five eighth parts of an Inch, and a very ſmall matter more, which is juſt ſo much as the *Toe* of the *Spindle* comes down in a quarter of a Revolution.

This is the Reaſon that the coming down of the *Toe* ought to be juſt thus much; for ſhould it be leſs, the natural Spring that all theſe Joynts have, when they are unſqueez'd, would mount the Irons of the *Tympans* ſo high, that it would be troubleſom and tedious for the *Preſs-man* to *Run* them under the *Plattin,* unleſs the *Cheeks* ſtood wider aſſunder, and conſequently every ſweep of the *Bar* in a *Pull* exceed a quarter of a Revolution, which would be both laborious for the *Preſs-man,* and would hinder his uſual riddance of Work.

I ſhew'd in *Numb.* 2. *fol.* 31, 32, 33, 34, 35. the manner of making a Screw in general; but aſſigned it no particular Riſe; which for the aforeſaid reaſon, theſe *Printing-Preſs Screws* are ſtrictly bound to have: Therefore its aſſigned Riſe being two Inches and an half in a Revolution, This meaſure muſt be ſet off upon the Cilindrick Shank, from the top towards the Cube of the *Spindle*, on any part of the *Cilinder*, and there make a ſmall mark with a fine *Prick-Punch*, and in an exact Perpendicular to this mark make another ſmall mark on the top of the Cilinder, and laying a ſtraight *Ruler* on theſe two marks, draw a ſtraight line through them, and continue that line almoſt as low as the Cube of the *Spindle*. Then devide that portion of the ſtraight line contained between the two marks into eight equal parts, and ſet off thoſe equal parts from the two Inch and half mark upwards, and then downwards in the line ſo oft as you can: Devide alſo the Circumference of the Shank of the Cilinder into eight equal parts, and draw ſtraight lines through each deviſion, parallel to the firſt upright line; and deſcribe the *Screw* as you were directed in the afore-quoted place; ſo will you find that the revolution of every line ſo carried on about the Shank of the Cilinder, will be juſt two Inches and an half off the top of the Shank: which meaſure and manner of working may be continued downward to within an Inch and an half of the Cube of the *Spindle*. This is the Rule and Meaſure that ought to be obſerv'd for ordinary *Preſſes*: But if for ſome by-reaſons the aforeſaid Meaſure of two Inches and an half muſt be varied, then the varied Meaſure muſt be ſet off from the top of the Cilinder, and working with that varied Meaſure as hath been directed, the *Toe* of the *Spindle* will come down lower in a revolution if the varied Meaſure be longer, or not ſo low if the varied Meaſure be ſhorter.

There is a Notion vulgarly accepted among Workmen, that the *Spindle* will Riſe more or leſs for the number of *Worms* winding about the Cilinder; for they think, or at leaſt by tradition are taught to ſay, that a *Three-Worm'd Spindle* comes faſter and lower down than a *four-Worm'd Spindle*: But the opinion is falſe; for if a *Spindle* were made but with a *Single-Worm*, and ſhould have this Meaſure, *viz.* Two Inches and an half ſet off from the top, and a *Worm* cut to make a Revolution to this Meaſure, it would come down juſt as faſt, and as low, as if there were two, three, four, five or ſix *Worms*, &c. cut in the ſame Meaſure: For indeed, the numbers of *Worms* are only made to preſerve the *Worms* of the *Spindle* and *Nut* from wearing each other out the faſter; for if the whole ſtreſs of a *Pull* ſhould bear againſt the Sholder of a ſingle *Worm*, it would wear and ſhake in the *Nut* ſooner by half than if the ſtreſs ſhould be borne by the Sholders of two *Worms*; and ſo proportionably for three, four, five *Worms*, *&c.*

But the reaſon why four *Worms* are generally made upon the *Spindle*, is becauſe the Diameters of the *Spindle* are generally of this propos'd ſize; and therefore a convenient ſtrength of Mettal may be had on this ſize for four *Worms*; But ſhould the Diameter of the *Spindle* be ſmaller, as they ſometimes are when the *Preſs* is deſigned for ſmall Work, only three *Worms* will be a properer number than four; becauſe when the Diameter is ſmall, the thickneſs of the *Worms* would alſo prove ſmall, and by the ſtreſs of a *Pull* would be more ſubject to break or tear the *Worms* either of the *Spindle* or *Nut.*

And thus I hope I have performed the promiſe here I made at the latter end of *Numb.* 2. Whether I refer you for the breadth, and reaſon of the breadth of the *Worm.*

¶. 13. *Of the* Bar *marked* B *in* Plate 8.

This *Bar* is Iron, containing in length about two Foot eight Inches and an half, from *a* to *b*, and its greateſt thickneſs, except the Sholder, an Inch and a quarter; The end *a* hath a Male-Screw about an Inch Diameter and an Inch long, to which a *Nut* with a Female-Screw in it as at C is fitted. The Iron *Nut* in which this Female-Screw is made, muſt be very ſtrong, *viz.* at leaſt an Inch thick, and an Inch and three quarters in Diameter; in two oppoſite ſides of it is made two Ears, which muſt alſo be very ſtrong, becauſe they muſt with heavy blows be knock't upon to draw the Sholder of the ſquare ſhank on the *Bar*, when the ſquare Pin is in the *Eye* of the *Spindle* cloſe and ſteddy up to the Cube on the *Spindle*. The ſquare Pin of the *Bar* marked *c* is made to fit juſt into the *Eye*, through the middle of the Cube of the *Spindle*, on the hither end of this ſquare Pin is made a Sholder or ſtop to this ſquare Pin, as at *d.* This Sholder muſt be Filed exactly Flat on all its four in-ſides, that they may be drawn cloſe and tight up to any flat ſide of the Cube on the *Spindle*; It is two Inches ſquare, that it may be drawn the firmer, and ſtop the ſteddyer againſt any of the flat ſides of the ſaid Cube, when it it is hard drawn by the ſtrength of the Female-Screw in the aforeſaid *Nut* at C. The thickneſs from *d* to *e* of this Sholder is about three quarters of an Inch, and is Bevil'd off towards the *Handle* of the *Bar* with a ſmall Molding.

The ſubſtance of this *Bar*, as aforeſaid, is about an Inch and a quarter; but its Corners are all the way flatted down till within five Inches of the end: And from theſe five Inches to the end, it is taper'd away, that the *Wooden-Handle* may be the ſtronger forced and faſtned upon it.

About four Inches off the Sholder, the *Bar* is bowed beyond a right Angle, yet not with an Angle, but a Bow, which therefore lies ready to the *Preſs-man*'s Hand, that he may Catch at it to draw the *Wooden-Handle* of the *Bar* within his reach.

This *Wooden-Handle* with long Working grows oft looſe; but then it is with hard blows on the end of it forced on again, which oft ſplits the *Wooden-Handle* and looſens the ſquare Pin at the other end of the *Bar*, in the *Eye* of the *Spindle*: To remedy which inconvenience, I uſed this Help, *viz.* To weld a piece of a Curtain-Rod as long as the *Wooden-Handle* of the *Bar*, to the end of the Iron *Bar*, and made a Male-ſcrew at the other end with a Female-ſcrew to fit it; Then I bored an hole quite through the *Wooden-Handle*, and Turn'd the very end of the *Wooden-Handle* with a ſmall hollow in it flat at the bottom, and deep enough to bury the Iron-*Nut* on the end of the Curtain-Rod,and when this Curtain-Rod was put through the Hollow in the *Wooden Handle* and Screwed faſt to it at the end, it kept the *Wooden-Handle*, from-flying off; Or if it looſened, by twiſting the *Nut* once or twice more about, it it was faſtned again.

¶. 14. *Of the* Hoſe, Garter, *and* Hoſe-Hooks.

The *Hoſe* are the upright Irons in Plate 8. at *a a*, They are about three quarters of an Inch ſquare, both their ends have Male-ſcrews on them ; The lower end is fitted into a ſquare Hole made at the parting of the *Hoſe Hooks*, which by a ſquare *Nut* with a Female-ſcrew in it, is Screwed tight up to them ; Their upper ends are let into ſquare Holes made at the ends of the *Garter*, and by *Nuts* with Female-Screws in them, and Ears to turn them about as at *l l* are drawn up higher , if the *Plattin-Cords* are too looſe ; or elſe let down lower if they are to tight:Theſe upper Screws are called the *Hoſe-Screws*.

The *Garter* (but more properly the *Coller*) marked *b b*, is the round Hoop incompaſſing the flat Groove or Neck in the Shank of the *Spindle* at *e e* ; This round Hoop is made of two half round Hoops,having in a Diametrical-line without the Hoop ſquare Irons of the ſame piece proceeding from them, and ſtanding out as far as *g g*, Theſe Irons are ſo let into each other , that they comply and run Range with the ſquare Sholders at both ends, wherein ſquare Holes are made at the ends of the *Hoſe*. They are Screwed together with two ſmall Screws, as at *h h*.

The four *Hoſe-Hooks* are marked *i i i i,* They proceed from two Branches of an Iron Hoop at *k* encompaſſing the lower-end of the *Spindle* , on either Corner of the Branch, and have notches filled in their outer ſides as in the Figure, which notches are to contain ſeveral Turns of *Whip-cord* in each notch, which *Whip cord* being alſo faſtned to the *Hooks* on the *Plattin,* holds the *Plattin* tight to the *Hooks* of the *Hoſe.*

¶. 15. *Of the* Ribs, *and* Cramp-Irons.

The *Ribs* are delineated in Plate 8. at E, they are made of four-ſquare Irons the length of the *Wooden-Ribs* and *End-Rails, viz.* Four Foot five Inches long, and three quarters of an Inch ſquare, only one end is batter'd to about a quarter of an Inch thick, and about two Inches and an half broad, in which battering four or five holes are Punch't for the nailing it down to the *Hind-Rail* of the *Wooden-Ribs.* The Fore-end is alſo batter'd down as the Hind-end, but bound downwards to a ſquare, that it may be nailed down on the outer-ſide of the *Fore-Rail* of the *Wooden-Ribs.*

Into the bottom of theſe *Ribs* , within nine Inches of the middle, on either ſide is made two Female-Duſtails about three quarters of an Inch broad , and half a quarter of an Inch thick, which Female-Duſtails have Male-Duſtails as at *a a a a* fitted ſtiff into them; about an Inch and three quarters long ; and theſe Male-Duſtails have an hole punched at either end , that when they are fitted into the Female-Duſtails in the *Ribs,* they may in theſe Holes be Nailed down the firmer to the *Wooden-Ribs.* Theſe

within half an Inch of the end is Filed another round Pin, which hath another Male-Screw on it, to which is fitted a ſquare Iron *Nut* with a Female-Screw in it.

On the Square Pin is fitted a *Winch* ſomewhat in form like a Jack-winch, but much ſtronger; the *Eye* of which is fitted upon the Square aforeſaid, and Screwed up tight with a Female-Screw. On the ſtraight Shank of this Winch is fitted the *Rounce*, marked *e.*

The round ends of this *Axis* are hung up in two Iron-Sockets (as at *c c*) faſtned with Nails (but more properly with Screws) on the outſide the Wooden Frame of the *Ribs.*

The *Girt-Barrel* marked *d* is Turned of a Piece of Maple or Alder-wood, of ſuch a length, that it may play eaſily between the two Wooden *Ribs*; and of ſuch a diameter, that in one revolution of it, ſuch a length of *Girt* may wind about it as ſhall be equal to half the length contained between the fore-end Iron of the *Tympan*, and the inſide of the Rail of the *Inner-Tympan*; becauſe two Revolutions of this *Barrel* muſt move the *Carriage* this length of ſpace

This *Barrel* is fitted and faſtned upon the Iron *Axis*, at ſuch a diſtance from either end, that it may move round between the Wooden *Ribs* aforeſaid.

¶. 17. *Of the* Preſs-Stone.

The *Preſs-Stone* ſhould be Marble, though ſometimes Maſter *Printers* make ſhift with Purbeck, either becauſe they can buy them cheaper, or elſe becauſe they can neither diſtinguiſh them by their appearance, or know their different worths.

Its thickneſs muſt be all the way throughout equal, and ought to be within one half quarter of an Inch the depth of the inſide of the *Coffin*; becauſe the matter it is *Bedded* in will raiſe it high enough. Its length and breadth muſt be about half an Inch leſs than the length and breadth of the inſide of the *Coffin*: Becauſe *Juſtifiers* of Wood, the length of every ſide, and almoſt the depth of the *Stone*, muſt be thruſt between the inſides of the *Coffin* and the outſides of the *Stone*, to Wedge it tight and ſteddy in its place; after the *Preſs-man* has *Bedded* it. Its upper-ſide, or Face muſt be exactly ſtraight and ſmooth.

I have given you this deſcription of the *Preſs-Stone*, becauſe they are thus generally uſed in all *Printing-Houſes*: But I have had ſo much trouble, charge and vexation with the often breaking of *Stones*, either through the careleſneſs or unskilfulneſs (or both) of *Preſs-men*, that neceſſity compell'd me to conſider how I might leave them off; and now by long experience I have found, that a piece of *Lignum-vitæ* of the ſame ſize, and truly wrought, performs the office of a *Stone* in all reſpects as well as a *Stone*, and eaſes my mind, of the trouble, charge and vexation aforeſaid, though the firſt coſt of it be greater.

¶. 18. *Of the* Plattin *marked* d *in Plate* 9.

The *Plattin* is commonly made of Beechen Planck, two Inches and an half thick, its length about fourteen Inches, and its breadth about nine Inches. Its ſides are Tryed Square, and the Face or under-ſide of the *Plattin* Plained exactly ſtraight and ſmooth. Near the four Corners on the upper-ſide, it hath four Iron *Hooks* as at *a a a a*, whoſe Shanks are Wormed in.

In the middle of the upper-ſide is let in and faſtned an Iron Plate called the *Plattin Plate*, as *b b b b*, a quarter of an Inch thick, ſix Inches long and four Inches broad; in the middle of this Plate is made a ſquare Iron Frame about half an Inch high, and half an Inch broad, as at *c*. Into this ſquare Frame is fitted the *Stud* of the *Plattin Pan*, ſo as it may ſtand ſteddy, and yet to be taken out and put in as occaſion may require.

This *Stud* marked *d*, is about an Inch thick, and then ſpreads wider and wider to the top (at *e e e e*) of it, till it becomes about two Inches and an half wide; and the ſides of this ſpreading being but about half a quarter of an Inch thick makes the *Pan*. In the middle of the bottom of this *Pan* is a ſmall Center hole Punch'd for the *Toe* of the *Spindle* to work in.

¶. 19. *Of the* Points *and* Point-Screws.

The Points are made of Iron Plates about the thickneſs of a Qneen *Elizabeth* Shilling: It is delineated at e in Plate 9. which is ſufficient to ſhew the ſhape of it, at the end of this Plate, as at *a*, ſtands upright the Point. This *Point* is made of a piece of ſmall Wyer about a quarter and half quarter of an Inch high, and hath its lower end Filed away to a ſmall Shank about twice the length of the thickneſs of the Plate; ſo that a Sholder may remain. This ſmall Shank is fitted into a ſmall Hole made near the end of the Plate, and Revetted on the other ſide, as was taught *Numb.* 2. *Fol.* 24. At the other end of the Plate is filed a long ſquare notch in the Plate as at *b c* quarter and half quarter Inch wide, to receive the ſquare ſhank of the *Point-Screws.*

The *Point-Screw* marked f is made of Iron; It hath a thin Head about an Inch ſquare, And a ſquare Shank juſt under the Head, an Inch deep, and almoſt quarter and half quarter Inch ſquare, that the ſquare Notch in the hinder end of the Plate may ſlide on it from end to end of the Notch; Under this ſquare Shank is a round Pin filed with a Male-Screw upon it, to which is fitted a *Nut* with a Female-Screw in it, and Ears on its out-ſide to twiſt about, and draw the Head of the Shank cloſe down to the *Tympan,* and ſo hold the *Point-Plate* faſt in its Place.

¶. 20. *Of the* Hammer, *deſcribed at* h, *and* Sheeps-Foot *deſcribed at* i *in Plate* 9.

The *Hammer* is a common *Hammer* about a quarter of a Pound weight; It hath no *Claws* but a *Pen,* which ſtands the *Preſs-man* inſtead when the *Chaſe* proves ſo big, that he is forced to uſe ſmall *Quoins.*

The Figure of the *Sheeps-Foot* is deſcription ſufficient. Its uſe is to nail and un-nail the *Balls.*

The *Sheeps-Foot* is all made of Iron, with an Hammer-head at one end, to drive the *Ball-Nails* into the *Ball Stocks,* and a Claw at the other end, to draw the *Ball-Nails* out of the *Ball-Stocks.*

¶. 21. *Of the* Foot-ſtep, Girts, Stay *of the* Carriage, Stay *of the* Frisket, Ball-Stocks, Paper-Bench, Lye-Trough, Lye-Bruſh, Lye-Kettle, Tray *to* wet Paper *in*, Weights to Preſs Paper, Pelts, *or* Leather, Wool *or* Hair, Ball-Nails *or* Pumping-Nails.

The *Foot Step* is an Inch-Board about a Foot broad, and ſixteen Inches long. This Board is nailed upon a piece of Timber about ſeven or eight Inches high, and is Bevil'd away on its upper-ſide, as is alſo the Board on its under-ſide at its hither end, that the Board may ſtand aſlope upon the Floor. It is placed faſt on the Floor under the Carriage of the Preſs. Its Office ſhall be ſhewed when we come to treat of Exerciſe of the *Preſs-man.*

Girts are Thongs of Leather, cut out of the Back of an Horſe-hide, or a Bulls hide, ſometimes an Hogs-hide. They are about an Inch and an half, or an Inch and three quarters broad. Two of them are uſed to carry the *Carriage* out and in. Theſe two have each of them one of their ends nailed to the *Barrel* on the *Spindle* of the *Rounce,* and the other ends nailed to the *Barrel* behind the *Carriage* in the *Planck* of the *Coffin,* and to the *Barrel* on the fore end of the Frame of the *Coffin.*

The *Stay* of the *Carriage* is ſometimes a piece of the ſame *Girt* faſtned to the outſide of the further *Cheek,* and to the further hinder ſide of the Frame of the *Carriage*. It is faſtned at ſuch a length by the *Preſs man*, that the *Carriage* may ride ſo far out, as that the Irons of the *Tympan* may juſt riſe free and clear off the fore-ſide of the *Plattin*.

Another way to ſtay the *Carriage* is to let an Iron Pin into the upper-ſide of the further Rail of the Frame of the *Ribs*, juſt in the place where the further hinder Rail of the *Carriage* ſtands projecting over the *Rib-Rail*, when the Iron of the *Tympan* may juſt riſe free from the Fore-ſide of the *Plattin*; for then that projecting will ſtop againſt the Iron Pin.

The *Stay* of the *Frisket* is made by faſtning a Batten upon the middle of the Top-ſide of the *Cap*, and by faſtning a Batten to the former Batten perpendicularly downwards, juſt at ſuch a diſtance, that the upper-ſide of the *Frisket* may ſtop againſt it when it is turned up juſt a little beyond a Perpendicular When a *Preſs* ſtands at a convenient diſtance from a Wall, that Wall performs the office of the aforeſaid *Stay*.

Ball-Stocks are Turn'd of *Alder* or *Maple*. Their Shape is delineated in Plate 9. at g: They are about ſeven Inches in Diameter, and have their under ſide Turned hollow, to contain the greater quantity of *Wool* or *Hair*, to keep the *Ball-Leathers* plump the longer.

The *Lye-Trough* (delineated in Plate 9. at k) is a Square Trough made of Inch-Boards; about four Inches deep, two Foot four Inches long, and one Foot nine Inches broad, and flat in the Bottom. Its inſide is Leaded with Sheet-Lead, which reaches up over the upper Edges of the *Trough*. In the middle of the two ends (for ſo I call the ſhorteſt ſides) on the outer ſides as *a a*, is faſtned a round Iron Pin, which moves in a round hole made in an Iron Stud with a ſquare Sprig under it, to be drove and faſtned into a *Wooden Horſe*, which *Horſe* I need not deſcribe, becauſe in Plate aforeſaid I have given you the Figure of it.

The *Paper Bench* is only a common Bench about three Foot eight Inches long, one Foot eight Inches broad, and three Foot four Inches high.

The *Lye Bruſh* is made of *Hogs-Briſtles* faſtned into a Board with Braſs Wyer, for durance ſake: Its Board is commonly about nine Inches long, and four and an half Inches broad; and the length of the Briſtles about three Inches.

To perform the Office of a *Lye Kettle* (which commonly holds about three Gallons) the old-faſhion'd *Chafers* are moſt commodious, as well becauſe they are more handy and manageable than *Kettles* with Bails, as alſo becauſe they keep *Lye* longer hot.

The *Tray* to *Wet Paper* in is only a common Butchers Tray, large enough to *Wet* the largeſt *Paper* in.

The *Weight* to *Preſs Paper* with, is either Mettal, or Stone, flat on the Bottom, to ly ſteddy on the *Paper-Board*: It muſt be about 50 or 60 pound weight.

For *Pelts* or *Leather*, *Ball-Nails* or *Pumping-Nails*, *Wool* or *Hair*, *Vellom* or *Parchment* or *Forrel*, the *Preſsman* generally eaſes the *Maſter-Printer* of the trouble of chooſing, though not the charge of paying for them: And for *Paſte*, *Sallad Oyl*, and ſuch accidental Requiſites as the *Preſs-man* in his work may want, the *Devil* commonly fetches for him.

¶. 22. *Of* Racks *to Hang* Paper *on, and of the* Peel.

Our Maſter-*Printer* muſt provide *Racks* to hang *Paper* on to *Dry*. They are made of Deal-board Battens, ſquare, an Inch thick; and an Inch and an half deep, and the length the whole length of the Deal, which is commonly about ten or eleven Foot long, or elſe ſo long as the convenience of the Room will allow: The two upper corners of theſe *Rails* are rounded off that they may not mark the *Paper*.

Theſe *Racks* are Hung over Head, either in the *Printing-Houſe*, or *Ware-houſe*, or both, or any other Room that is moſt convenient to *Dry Paper* in; they are hung a-thwart two *Rails* an Inch thick, and about three or four Inches deep, which *Rails* are faſtned to ſome Joyſts or other Timber in the Ceiling by Stiles perpendicular to the Ceiling; Theſe *Rails* ſtand ſo wide aſſunder, that each end of the *Racks* may hang beyond them about the diſtance of two Foot, and have on their upper edge at ten Inches diſtance from one another, ſo many ſquare Notches cut into them as the whole length of the *Rail* will bear; Into theſe ſquare notches the *Racks* are laid parallel to each other with the flat ſide downwards, and the Rounded off ſide upwards.

The *Peel* is deſcribed in Plate 9. at I, which Figure ſufficiently ſhews what it is; And therefore I ſhall need ſay no more to it, only its Handle may be longer or ſhorter according as the height of the Room it is to be uſed in may require.

¶. 23. *Of* Inck.

The providing of good *Inck*, or rather good *Varniſh* for *Inck*, is none of the leaſt incumbent cares upon our *Maſter-Printer*, though Cuſtom has almoſt made it ſo here in *England*; for the proceſs of making *Inck* being as well laborious to the Body, as noyſom and ungrateful to the Sence, and by ſeveral odd accidents dangerous of Firing the Place it is made in, Our *Engliſh Maſter Printers* do generally diſcharge themſelves of that trouble; and inſtead of having good *Inck*, content themſelves that they pay an *Inck-maker* for good *Inck*, which may yet be better or worſe according to the Conſcience of the *Inck-maker*

That our Neighbours the *Hollanders* who exhibit Patterns of good *Printing* to all the World, are careful and induſtrious in all the circumſtances of good *Printing*, is very notorious to all Book-men; yet ſhould they content themſelves with ſuch *Inck* as we do, their Work would appear notwithſtanding the other circumſtances they obſerve, far leſs graceful than it does, as well as ours would appear more beautiful if we uſed ſuch *Inck* as they do: for there is many Reaſons, conſidering how the *Inck* is made with us and with them, why their *Inck* muſt needs be better than ours. As *Firſt*, They make theirs all of good old *Linſeed-Oyl* alone, and perhaps a little *Roſin* in it ſometimes, when as our *Inck-makers* to ſave charges mingle many times *Trane-Oyl* among theirs, and a great deal of *Roſin*; which *Trane-Oyl* by its groſsneſs, Furs and Choaks up a *Form*, and by its fatneſs hinders the *Inck* from drying; ſo that when the Work comes to the *Binders*, it *Sets off*; and beſides is dull, ſmeary and unpleaſant to the Eye. And the *Roſin* if too great a quantity be put in, and the *Form* be not very *Lean Beaten*, makes the *Inck* turn yellow: And the ſame does New *Linſeed-Oyl*.

Secondly, They ſeldom *Boyl* or *Burn* it to that conſiſtence the *Hollanders* do, becauſe they not only ſave labour and Fewel, but have a greater weight of *Inck* out of the ſame quantity of *Oyl* when leſs *Burnt* away than when more *Burnt* away; which want of Burning makes the *Inck* alſo, though made of good old *Linſeed Oyl*, Fat and Smeary, and hinders its *Drying*; ſo that when it comes to the *Binders* it alſo *Sets off*.

Thirdly, They do not uſe that way of clearing their *Inck* the *Hollanders* do, or indeed any other way than meer Burning it, whereby the *Inck* remains more *Oyly* and *Greaſie* than if it were well clarified.

Fourthly, They to ſave the *Preſs-man* the labour of *Rubbing* the *Blacking* into *Varniſh* on the *Inck-Block*, *Boyl* the *Blacking* in the *Varniſh*, or at leaſt put the *Blacking* in whilſt the *Varniſh* is yet *Boyling-hot*, which ſo *Burns* and *Rubifies* the *Blacking*, that it loſes much much of its brisk and vivid black complexion.

Fifthly, Becauſe *Blacking* is dear, and adds little to the weight of *Inck*, they ſtint themſelves to a quantity which they exceed not; ſo that ſometimes the *Inck* proves ſo unſufferable *Pale*, that the *Preſs-man* is forc'd to *Rub* in more *Blacking* upon the *Block*; yet this he is often ſo loth to do, that he will rather hazard the content the Colour ſhall give, than take the pains to amend it: ſatisfying himſelf that he can lay the blame upon the *Inck-maker*.

Having thus hinted at the difference between the *Dutch* and *Engliſh Inck*, I ſhall now give you the Receipt and manner of making the *Dutch-Varniſh*.

They provide a *Kettle* or a *Caldron*, but a *Caldron* is more proper, ſuch an one as is deſcribed in Plate 9. at m. This Veſſel ſhould hold twice ſo much *Oyl* as they intend to *Boyl*, that the *Scum* may be ſome conſiderable time a *Riſing* from the top of the *Oyl* to the top of the Veſſel to prevent danger. This *Caldron*

dron hath a Copper Cover to fit the Mouth of it, and this Cover hath an Handle at the top of it to take it off and put it on by. This *Caldron* is ſet upon a good ſtrong Iron *Trevet*, and fill'd half full of old *Linſeed-Oyl*, the older the better, and hath a good Fire made under it of ſolid matter, either *Sea Coal, Charcoal* or pretty big Chumps of Wood that will burn well without much Flame; for ſhould the Flame riſe too high, and the *Oyl* be very hot at the taking off the Cover of the *Caldron*, the fume of the *Oyl* might be apt to take Fire at the Flame, and endanger the loſs of the *Oyl* and Firing the Houſe: Thus they let *Oyl* heat in the *Caldron* till they think it is Boyling-hot; which to know, they peel the outer Films of an *Oynion* oft it, and prick the *Oynion* faſt upon the end of a ſmall long Stick, and ſo put it into the heating *Oyl*: If it be Boyling-hot, or almoſt Boyling-hot, the *Oynion* will put the *Oyl* into a Fermentation, ſo that a Scum will gather on the top of the *Oyl*, and riſe by degrees, and that more or leſs according as it is more or leſs Hot: But if it be ſo very Hot that the Scum riſes apace, they quickly take the *Oynion* out, and by degrees the Scum will fall. But if the *Oyl* be Hot enough, and they intend to put any *Roſin* in, the quantity is to every Gallon of *Oyl* half a Pound, or rarely a whole Pound. The *Roſin* they beat ſmall in a *Mortar*, and with an Iron Ladle, or elſe by an Handful at a time ſtrew it in gently into the *Oyl* leſt it make the Scum riſe too faſt; but every Ladle-full or Handful they put in ſo leaſurely after one another, that the firſt muſt be wholly diſſolv'd before they put any more in; for elſe the Scum will Riſe too faſt, as aforeſaid: So that you may perceive a great care is to keep the Scum down: For if it Boyl over into the Fire never ſo little, the whole Body of *Oyl* will take Fire immediately.

If the *Oyl* be Hot enough to *Burn*, they *Burn* it, and that ſo often till it be *Hard* enough, which ſometimes is ſix, ſeven, eight times, or more.

To *Burn* it they take a long ſmall Stick, or double up half a Sheet of Paper; and light one end to ſet Fire to the *Oyl*; It will preſently Take if the *Oyl* be Hot enough, if not, they Boyl it longer, till it be.

To try if it be *Hard* enough, they put the end of a Stick into the *Oyl*, which will lick up about three or four drops, which they put upon an Oyſter-ſhell, or ſome ſuch thing, and ſet it by to cool, and when it is cold they touch it with their Fore or Middle-Finger and Thumb, and try its conſiſtence by ſticking together of their Finger and Thumb; for if it draw ſtiff like ſtrong *Turpentine* it is Hard enough, if not, they Boyl it longer, or *Burn* it again till it be ſo conſolidated.

When it is well Boyled they throw in an Ounce of Letharge of Silver to every four Gallons of *Oyl* to Clarifie it, and Boyl it gently once again, and then take it off the Fire to ſtand and cool, and when it is cool enough to put their Hand in, they Strain it through a Linnen Cloath, and with their Hands wring all the *Varniſh* out into a Leaded Stone Pot or Pan, and keeping it covered, ſet it by for their uſe; The longer it ſtands by the better, becauſe it is leſs ſubject to turn Yellow on the Paper that is Printed with it.

This is the *Dutch* way of making *Varniſh*, and the way the Engliſh *Inck makers* ought to uſe.

Note, Firſt, That the *Varniſh* may be made without *Burning* the *Oyl, viz.* only with well and long

Boyling it; for *Burning* is but a violent way of Boyling, to conſolidate it the ſooner.

Secondly, That an *Apple* or a *Cruſt* of *Bread,&c.* ſtuck upon the end of a Stick inſtead of an *Oynion* will alſo make the Scum of the *Oyl* riſe: For it is only the Air contained in the Pores of the *Apple, Cruſt* or *Oynion*, &c. preſſed or forced out by the violent heat of the *Oyl*, that raiſes the many Bubbles on the top of the *Oyl*: And the connection of thoſe Bubbles are vulgarly called *Scum*.

Thirdly, The Engliſh *Inck-makers* that often make *Inck*,and that in great quantities, becauſe one Man may ſerve all *England*, inſtead of ſetting a *Caldron* on a *Trevet*, build a *Furnace* under a great *Caldron*, and Trim it about ſo with Brick,that it Boyls far ſooner and more ſecurely than on a *Trevet*; becauſe if the *Oyl* ſhould chance to Boyl over, yet can it not run into the Fire, being Fenced round about with Brick as aforeſaid, and the *Stoking-hole* lying far under the *Caldron*.

Fourthly, When for want of a *Caldron* the *Maſter-Printer* makes *Varniſh* in a *Kettle*, He provides a great piece of thick *Canvaſs*, big enough when three or four double to cover the *Kettle*, and alſo to hang half round the ſides of the *Kettle*: This *Canvaſs* (to make it more ſoluble) is wet in Water, and the Water well wrung out again, ſo that the *Canvaſs* remains only moiſt: Its uſe is to throw flat over the Mouth of the *Kettle* when the *Oyl* is *Burning*, to keep the ſmoak in, that it may ſtifle the Flame when they ſee cauſe to put it out. But the Water as was ſaid before, muſt be very well wrung out of the *Canvaſs*, for ſhould but a drop or two fall from the ſides of it into the *Oyl* when it is Burning, it will ſo enrage the *Oyl*, and raiſe the Scum, that it might endanger the working over the top of the *Kettle*.

Having ſhewn you the *Maſter-Printers* Office, I account it ſuitable to proper Method, to let you know how the *Letter-Founder* Cuts the *Punches*,how the *Molds* are made,the *Matrices* Sunck, and the *Letter Caſt* and *Dreſt*; for all theſe Operations precede the *Compoſiters* Trade, as the *Compoſiters* does the *Preſsmans*; wherefore the next *Exerciſes* ſhall be (God willing) upon *Cutting* of the *Steel-Punches* ME-

MECHANICK EXERCISES:
Or, the Doctrine of
Handy-works.
Applied to the Art of
Letter-Cutting.
The Second VOLUMNE.

PREFACE.

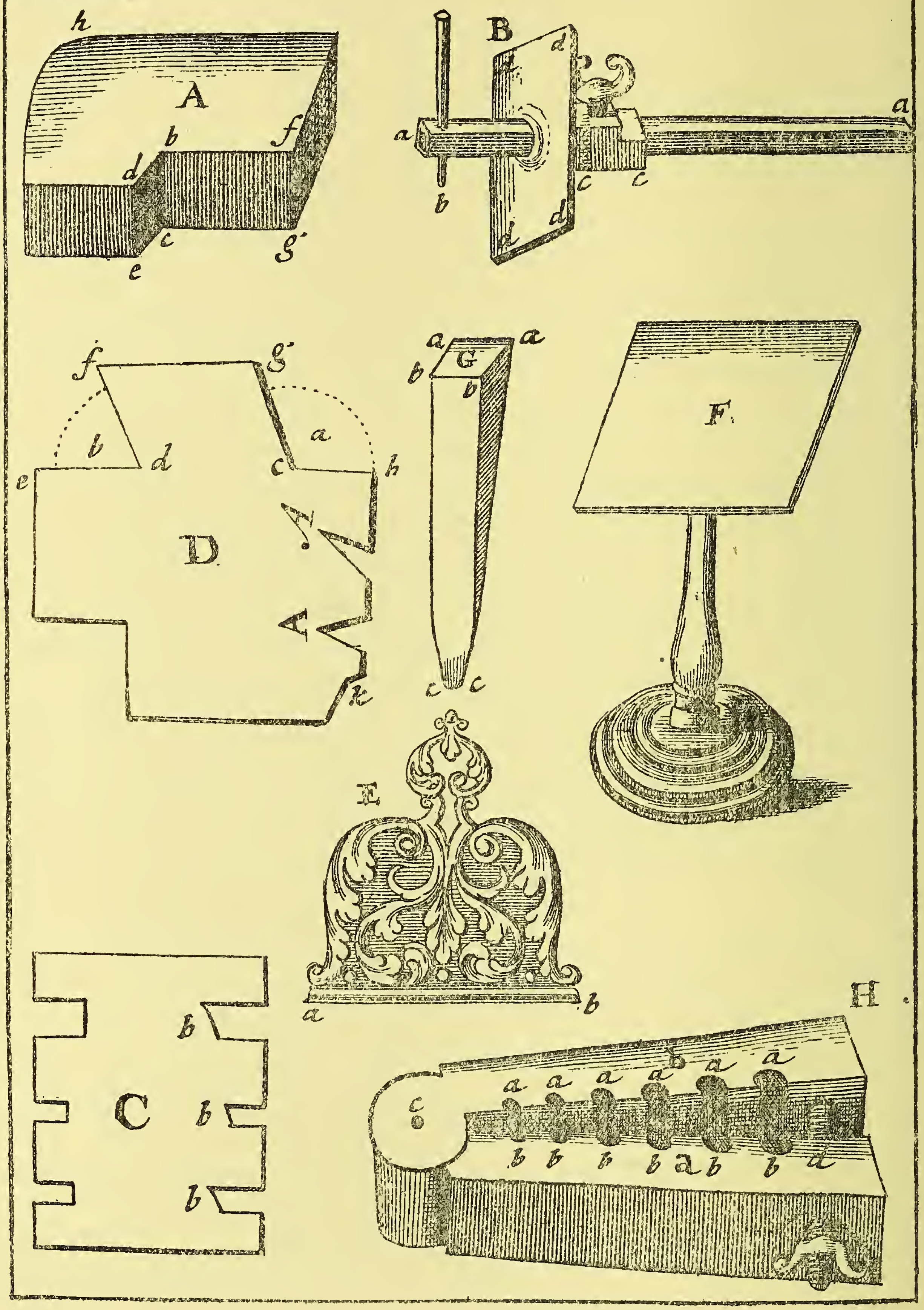
LEtter-Cutting *is a Handy-Work hitherto kept ſo conceal'd among the Artificers of it, that I cannot learn any one hath taught it any other; But every one that has uſed it, Learnt it of his own* Genuine Inclination. *Therefore, though I cannot (as in other Trades) deſcribe the general Practice of Work-men, yet the Rules I follow I ſhall ſhew here, and have as good an Opinion of theſe Rules, as thoſe have that are ſhyeſt of diſcovering theirs. For, indeed, by the appearance of ſome Work done, a judicious Eye may doubt whether they go by any Rule at all, though* Geometrick *Rules, in no* Practice *whatever, ought to be more nicely or exactly obſerved than in this.*

§. 12. ¶. 1. *Of Letter-Cutters Tools.*

THe making of *Steel Punches* is a Branch of the *Smith*'s Trade: For, as I told you in the Preface to *Numb.* 1. The *Black-Smith*'s Trade comprehends all Trades that uſe either Forge or File, from the *Anchor-Smith*, to the *Watch-maker*: They all working by the ſame Rules, though not with equal exactneſs; and all uſing the ſame Tools, though of different Sizes from thoſe the Common *Black-Smith* uſes; and that according to the various purpoſes they are applied, *&c.* Therefore, indeed, a *Letter-Cutter* ſhould have a Forge ſet up, as by *Numb.* 1. But ſome *Letter-Cutters* may ſeem to ſcorn to uſe a Forge, as accounting it too hard Labour, and Ungenteel for themſelves to officiate at. Yet they all well know, that though they may have a common *Black-Smith* perform their much and heavy Work, that many times a Forge of their own at Hand would be very commodious for them in ſeveral accidental little and light Jobs, which (in a Train of Work) they muſt meet withal.

But if our *Letter-Cutter* will have no Forge, yet he muſt of neceſſity accommodate himſelf with a *Vice*, *Hand-Vice*, *Hammers*, *Files*, *Small* and *Fine Files* (commonly called *Watch-makers Files*) of theſe he ſaves all, as they wear out, to ſmooth and burniſh the Sides and Face of his Letter with, as ſhall be ſhewed; *Gravers*, and *Sculpters* of all ſorts, an *Anvil*, or a *Stake*, an *Oyl-ſtone*, *&c.* And of theſe, ſuch as are ſuitable and ſizable to the ſeveral Letters he

Plate 10.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he is to Cut. Theſe, or many of theſe Tools, being deſcribed in *Numb.* 1. I refer my Reader thither, and proceed to give an account of ſome Tools peculiar to the *Letter-Cutter*, though not of particular uſe to the Common *Black-Smith*.

¶. 2. *Of the* Uſing-File.

This *File* is about nine or ten Inches long, and three or four Inches broad, and three quarters of an Inch thick: The two broad ſides muſt be exactly flat and ſtraight: And the one ſide is commonly cut with a *Baſtard-Cut*, the other with a *Fine* or *Smooth Cut.* (See *Numb.* 1. *Fol.* 14, 15.) Its uſe is to *Rub* a piece of Steel, Iron, or Braſs, *&c.* flat and ſtraight upon, as ſhall be ſhewed hereafter.

In chuſing it, you muſt ſee it be exactly Flat and Straight all its Length and Breadth: For if it in any part Belly out, or be Hollow inwards, what is Rubbed upon it will be Hollow, Rubbing on the Bellying part; and Bellying, Rubbing on the Hollow part. You muſt alſo ſee that it be very Hard; and therefore the thickeſt *Uſing-Files* are likelieſt to prove beſt, becauſe the thin commonly Warp in Hardning.

¶. 3. *Of the* Flat-Gage.

The *Flat-Gage* is deſcribed in *Plate* 10. at A. It is made of a flat piece of Box, or other Hard Wood. Its Length is three Inches and an half, its Breadth two Inches and an half, and its Thickneſs one Inch and an half. This is on the Flat, firſt made Square, but afterwards hath one of its Corners (as *b*) a little rounded off, that it may the eaſier comply with the Ball of the Hand. Out of one of its longeſt Sides, *viz.* that not rounded off, is Cut through the thickneſs of it an exact Square, whoſe one ſide *b f*, *c g* is about an Inch and three quarters long; and its other ſide *b d*, *c e* about half an Inch long. The Depth of theſe Sides and their Angle is exactly Square to the top and bottom of the upper and under Superficies of the *Flat-Gage.*

Its Uſe is to hold a Rod of Steel, or Body of a *Mold*, *&c.* exactly perpendicular to the Flat of the *Uſing-File*, that the end of it may rub upon the *Uſing-File*, and be Filed away exactly Square, and that to the Shank; as ſhall more at large be ſhewed in §. 2. ¶. 3.

¶. 4. *Of the* Sliding Gage.

The *Sliding Gage* is deſcribed in *Plate* 10. at *Fig.* B. It is a Tool commonly uſed by *Mathematical Inſtrument-Makers*, and I have found it of great uſe in *Letter-Cutting*, and making of *Molds*, *&c.* *a a* the Beam, *b* the Tooth, *c c* the Sliding Socket, *d d d d* the Shoulder of the Socket.

Its Uſe is to meaſure and ſet off Diſtances between the Sholder and the Tooth, and to mark it off from the end, or elſe from the edge of your Work.

I always uſe two or three of theſe *Gages*, that I need not remove the Sholder when it is ſet to a Diſtance which I may have after-uſe for; as ſhall in Working be ſhewed more fully.

¶. 5.

¶. 5. *Of the* Face-Gages, *marked* C *in Plate* 10.

The *Face-Gage* is a Square Notch cut with a File into the edge of a thin Plate of Steel, Iron, or Braſs, the thickneſs of a piece of common Latton, and the Notch about an *Engliſh* deep. There be three of theſe Gages made, for the Letters to be cut on one Body; but they may be all made upon one thin Plate, the readier to be found, as at D. As firſt, for the Long Letters; Secondly, for the Aſſending Letters; And Thirdly, for the Short Letters. The Length of theſe ſeveral Notches, or Gages, have their Proportions to the Body they are cut to, and are as follows. We ſhall imagine (for in Practice it cannot well be perform'd, unleſs in very large Bodies) that the Length of the whole Body is divided into forty and two equal Parts.

The *Gage* for the Long Letters are the length of the whole Body, *viz.* forty and two equal Parts. The *Gage* for the Aſſending Letters, *Roman* and *Italica*, are five Seventh Parts of the Body, *viz.* thirty Parts of Forty two, and thirty and three Parts for *Engliſh* Face. The *Gage* for the Short Letters are three Seventh Parts of the whole Body, *viz.* eighteen Parts of Forty two for the *Roman* and *Italica*, and twenty two Parts for the *Engliſh* Face.

It may indeed be thought impoſſible to divide a Body into ſeven equal Parts, and much more difficult to divide each of thoſe ſeven equal Parts into ſix equal Parts, which are Forty two, as aforeſaid, eſpecially if the Body be but ſmall; but yet it is poſſible with curious Working: For ſeven thin Spaces may be Caſt and Rubb'd to do it. And for dividing each of the thin Spaces into ſix equal Parts, you may Caſt and Rub Full Point . to be of the thickneſs of one thin Space, and one ſixth part of a thin Space: And you may Caſt and Rub : to be the thickneſs of one thin Space, and two ſixth parts of a thin Space: And you may Caſt and Rub , to be the thickneſs of one thin Space, and three ſixth parts of a thin Space: And you may Caſt and Rub - to be the thickneſs of one thin Space, and four ſixth parts of a thin Space: And you may Caſt and Rub ; to be the thickneſs of one thin Space, and five ſixth parts of a thin Space.

The reaſon why I propoſe . to be Caſt and Rubb'd one ſixth part thicker than a thin Space, is only that it may be readily diſtinguiſhed from : , - ; which are two ſixth parts, three ſixth parts, four ſixth parts, five ſixth parts thicker than a thin Space. And for ſix ſixth parts thicker than a thin Space, two thin Spaces does it.

The manner of adjuſting theſe ſeveral Sixth Parts of Thickneſſes is as follows. You may try if ſix . exactly agree, and be even with ſeven thin Spaces; (or, which is all one, a Body) for then is each of thoſe ſix . one ſixth part thicker than a thin Space, becauſe it drives out a thin Space in ſix thin Spaces. And you may try if ſix : be equal to a Body and one thin Space; for then is each : two ſixth parts thicker than a thin Space. If ſix , be equal to nine thin Spaces, then each , is three ſixth parts of a thin Space thicker than a thin Space. If ſix -

be equal to ten thin Spaces, then each - is four ſixth parts of a thin Space thicker than a thin Space. If ſix ; - be equal to eleven thin Spaces, then each ; is five ſixth parts of a thin Space thicker than a thin Space.

Now, as aforeſaid, a thin Space being one ſeventh part of the Body, and the thin Space thus divided, you have the whole Body actually divided into forty and two equal parts, as I have divided them in my Drafts of Letters down the Sides, and in the Bottom Line.

Though I have thus ſhewed how to divide a thin Space into ſix equal Parts, yet when the Letter to be Cut proves of a ſmall Body, the thin Space divided into two equal Parts may ſerve: If it prove bigger, into three or four equal Parts: And of the the largeſt Bodies, they may be divided into ſix, as aforeſaid.

If now you would make a *Gage* for any number of thin Spaces and Sixth Parts of a thin Space, you muſt take one thin Space leſs than the number of thin Spaces propoſed, and add . : , - ; according as the number of ſixth Parts of a thin Space require; and to thoſe complicated Thickneſſes you may file a ſquare Notch on the edge of the thin Plate aforeſaid, which ſhall be a ſtanding Gage or Meaſure for that number of thin Spaces and ſixth Parts of a thin Space.

All the Exception againſt this way of Meaſuring is, that thin Spaces caſt in Metal may be ſubject to bow, and ſo their Thickneſſes may prove deceitful. But, in Anſwer to that, I ſay, you may, if you will, Caſt I for two thin Spaces thick, e for three thin Spaces thick, S for four thin Spaces thick, L for five thin Spaces thick, D for ſix thin Spaces thick, or any other Letters near theſe ſeveral Thickneſſes, as you think fit; only remember, or rather, make a Table of the number of thin Spaces that each Letter on the Shank is Caſt for. And by complicating the Letters and Points, as aforeſaid, you will have any Thickneſs, either to make a Gage by, or to uſe otherwiſe.

On the other Edge of the *Face-Gage* you may file three other Notches, of the ſame Width with thoſe on the former Edge, for the Long, the Aſſending, and Short Letters. But though the two ſides of each of theſe Notches are parallel to each other, yet is not the third ſide ſquare to them, but hath the ſame Slope the *Italick* hath from the *Roman*; as you may ſee in the Figure at *b b b.*

¶. 6. *Of* Italick, *and other* Standing Gages.

Theſe *Gages* are to meaſure (as aforeſaid) the Slope of the *Italick* Stems, by applying the Top and Bottom of the *Gage* to the Top and Bottom Lines of the Letters, and the other Side of the *Gage* to the Stem: for when the Letter complies with theſe three ſides of the *Gage* that Letter hath its true Slope.

The manner of making theſe *Gages* (and indeed all other *Angular Gages*) is thus.

Place one Point of a Pair of Steel *Dividers* upon the thin Plate aforeſaid, at the Point *c* or *d* (in

Fig. D in *Plate* 10. and with the other Point deſcribe a ſmall fine Arch of a Circle; as, *e f* or *g h*. In this Arch of the Circle muſt be ſet off on the *Gage a* 110 Degrees, and on the *Gage b* 70 Degrees, and draw from the Centres *c* and *d* two ſtraight Lines through thoſe numbers of Degrees: Then Filing away the Plate between the two Lines, the *Gages* are finiſhed.

To find the Meaſure of this, or any other number of Degrees, do thus; Deſcribe a Circle on a piece of Plate-Braſs of any Radius (but the larger the better) draw a ſtraight Line exactly through the Centre of this Circle, and another ſtraight Line to cut this ſtraight Line at right Angles in the Centre, through the Circle; ſo ſhall the Circle be divided into four Quadrants: Then fix one Foot of your Compaſſes (being yet unſtirr'd) in one of the Points where any of the ſtraight Lines cuts the Circle, and extend the moving Foot of your Compaſſes where it will fall in the Circle, and make there a Mark, which is 60 Degrees from the fixed Foot of the Compaſſes: Then fix again one Foot of your Compaſſes in the Interſection of the ſtraight Line and Circle that is next the Mark that was made before, and extend the moving Foot in the ſame Quadrant towards the ſtraight Line where you firſt pitch'd the Foot of your Compaſſes, and with the moving Foot make another Mark in the Circle. Theſe two Marks divide the Quadrant into three equal Parts: The ſame way you may divide the other three Quadrants; ſo ſhall the whole Circle be divided into twelve equal Parts; and each of theſe twelve equal parts contain an Arch of thirty Degrees: Then with your Dividers divide each of theſe 30 Degrees into three equal Parts, and each of theſe three equal Parts intwo equal Parts, and each of theſe two equal Parts into five equal Parts, ſo ſhall the Circle be divided into 360 equal Parts, for your uſe.

To uſe it, deſcribe on the Centre of the Circle an Arch of almoſt a Semi-Circle: This Arch muſt be exactly of the ſame Radius with that I preſcribed to be made on the *Gages a b*, from *e* to *f*, and from *g* to *h*; then count in your Circle of Degrees from any Diametral Line 110 Degrees; and laying a ſtraight Ruler on the Centre, and on the 110 Degrees aforeſaid, make a ſmall Mark through the the ſmall Arch; and placing one Foot of your Compaſſes at the Interſection of the ſmall Arch, with the Diametral Line, open the other Foot to the Mark made on the ſmall Arch for 110 Degrees, and tranſfer that Diſtance to the ſmall Arch made on the *Gage:* Then through the Marks that the two Points of your Compaſſes make in the ſmall Arch on the *Gage*, draw two ſtraight Lines from the Centre *c:* and the Braſs between thoſe two ſtraight Lines being filed away, that *Gage* is made. In like manner you may ſet off any other number of Degrees, for the making of any other *Gage*.

In like manner, you may meaſure any Angle in the Drafts of Letters, by deſcribing a ſmall Arch on the Angular Point, and an Arch of the ſame Radius on the Centre of your divided Circle: For then, placing one Foot of your Compaſſes at the Interſection of the ſmall Arch with either of the ſtraight

Lines proceeding from the Angle in the Draſt, and extending the other Foot to the Interſection of the ſmall Arch, with the other ſtraight Line that proceeds from the Angle,you have between the Feet of your Compaſſes, the Width of the Angle; and by placing one Foot of your Compaſſes at the Interſection of any of the ſtraight Lines that proceed from the Centre of the divided Circle, and the ſmall Arch you made on it, and making a Mark where the other Foot of your Compaſſes falls in the ſaid ſmall Arch, you may, by a ſtraight Ruler laid on the Centre of the divided Circle, and the Mark on the ſmall Arch, ſee in the Limb of the Circle the number of Degrees contained between the Diametral, or ſtraight Line and the Mark.

If you have already a dividing-Plate of 360 Degrees, of a larger Radius than the Arch on your *Gage*, you may ſave your ſelf the labour of dividing a Circle (as aforeſaid,) and work by your dividing-Plate as you were directed to do with the Circle that I ſhewed you to divide.

In theſe Documents I have expoſed my ſelf to a double Cenſure; Firſt, of *Geometricians:* Secondly, of *Letter-Cutters*. *Geometricians* will cenſure me for writing anew that which almoſt every young Beginner knows: And *Letter-Cutters* will cenſure me for propoſing a Rule for that which they dare pretend they can do without Rule.

To the *Geometricians* I croſs the Cudgels: yet I writ this not to them; and I doubt I have written ſuperfluouſly to *Letter-Cutters*, becauſe I think few of them either will or care to take pains to underſtand theſe ſmall Rudiments of *Geometry*. If they do, and be ingenious, they will thank me for diſcovering this Help in their own Way, which few of them know. For by this Rule they will not only make Letters truer, but alſo quicker, and with leſs care; becauſe they ſhall never need to ſtamp their *Counter-Punch* in Lead, to ſee how it pleaſes them; which they do many times, before they like their *Counter-Punch*, be it of A *A* V v W w *V W*, and ſeveral other Letters) and at laſt finiſh their *Counter-Punch* but with a good Opinion they have that it may do well, though they frequently ſee it does not in many Angular Letters on different Bodies Cut by the ſame Hand. And were *Letter-Cutting* brought to ſo common Practice as *Joynery*, *Cabinet-making*, or *Mathematical Inſtrument-making*, every young Beginner ſhould then be taught by Rules, as they of theſe Trades are; becauſe *Letter-Cutting* depends as much upon Rule and Compaſs as any other Trade does.

You may in other places, where you find moſt Convenience (as at *i*) make a Square, which may ſtand you in ſtead for the Squaring the Face and Stems of the *Punch* in *Roman* Letters, and alſo in many other Uſes.

And you may make *Gages*, as you were taught before to try the *Counter-Punches* of Angular Letters; as, A K M N V X Y Z, *Romans* and *Italicks*, *Capitals* and *Lower-Caſe*. But then, that you may know each diſtinct *Gage*, you may engrave on the ſeveral reſpective *Gages*, at the Angle, A *A* 4 *&c.* For by examining by the Drafts of Letters, what Angle their Inſides make, you may ſet that Angle off, and make the *Gage* as you were taught before, in the *Gage* for the Slope of *Italicks*.

¶ 7. *Of the* Liner.

The *Liner* is marked E in *Plate* 10. It is a thin Plate of Iron or Braſs, whoſe Draft is ſufficient to expreſs the Shape. The Uſe of it is on the under-edge *a b* (which is about three Inches long) and is made truly ſtraight, and pretty ſharp or fine; that being applied to the Face of a *Punch*, or other piece of Work, it may ſhew whether it be ſtraight or no.

¶. 8. *Of the* Flat-Table.

The *Flat-Table* at F in *Plate* 10. The Figure is there ſufficient. All its Uſe is the Table F, for that is about one Inch and an half ſquare, and on its Superficies exactly ſtraight and flat. It is made of Iron or Braſs, but Braſs moſt proper. Its Uſe is to try if the Shank of a *Punch* be exactly Perpendicular to its Face, when the Face is ſet upon the *Table*; for if the Shank ſtand then directly upright to the Face of the *Table*, and lean not to any ſide of it, it is concluded to be perpendicular.

It hath ſeveral other Uſes, which, when we come to *Caſting* of *Letters*, and *Juſtifying* of *Matrices*, ſhall be ſhewn.

¶. 9. *Of the* Tach.

The *Tach* is a piece of Hard-Wood, (Box is very good) about three Inches broad, ſix Inches long, and three quarters of an Inch thick. About half its Length is faſtned firm down upon the *Work-Bench*, and its other half projects over the hither Edge of it. It hath three or four Angular Notches on its Fore-end to reſt and hold the Shank of a *Punch* ſteady when the End of the *Punch* is ſcrewed in the *Hand-Vice*, and the *Hand-Vice* held in the Left Hand, while the *Work-man* Files or Graves on it with his Right Hand.

Inſtead of Faſtning the *Tach* to the *Bench*, I *Saw* a ſquare piece out of the further half of the *Tach*, that it may not be too wide for the Chaps of the *Vice* to take and ſcrew that narrow End into the Chaps of the *Vice*, becauſe it ſhould be leſs cumberſome to my *Work-Bench.*

¶. 10. *Of Furniſhing the* Work-Bench.

The *Work-man* hath all his great *Files* placed in Leather Nooſes, with their Handles upwards, that he may readily diſtinguiſh the *File* he wants from another *File*. Theſe Nooſes are nailed on a Board that Caſes the Wall on his Right Hand, and as near his *Vice* as Convenience will admit, that he may the readier take any *File* he wants.

He hath alſo on his Right Hand a Tin Pot, of about a Pint, with ſmall *Files* ſtanding in it, with their Handles downwards, that their Blades may be the readier ſeen. Theſe ſmall *Files* are called *Watchmakers Files*, and the *Letter-Cutter* hath occaſion to uſe theſe of all Shapes, *viz.* *Flat*, *Pillar*, *Square*, *Triangular*, *Round*, *Half-Round*, *Knife-Files*, *&c.*

He alſo provides a ſhallow ſquare Box, of about five Inches long, and three Inches broad, to lay his ſmall Inſtruments in; as, his *Gages*, his *Liner*, ſome common *Punches*, *&c.* This Box he places before him, at the further ſide of the *Work-Bench.*

He alſo provides a good *Oyl-Stone*, to ſharpen his *Gravers* and *Sculpters* on. This he places at ſome diſtance from the *Vice*, on his Left Hand.

§. 13. ¶. 1. *Of* Letter-Cutting.

The *Letter-Cutter* does either Forge his *Steel-Punches*, or procures them to be forged; as I ſhewed, *Numb.*1. *Fol.*8,9,10. in *Vol.*I. *&c.* But great care muſt be taken, that the Steel be ſound, and free from Veins of Iron, Cracks and Flaws, which may be diſcerned; as I ſhewed in *Numb.* 3. *Vol.* I. For if there be any Veins of Iron in the Steel, when the Letter is Cut and Temper'd, and you would Sink the *Punch* into the Copper, it will batter there: Or it will Crack or Break if there be Flaws.

If there be Iron in it, it muſt with the Chiſſel be ſplit upon a good Blood-Red-Heat in that place, and the Iron taken or wrought out; and then with another, or more Welding Heat, or Heats, well doubled up, and laboured together, till the Steel become a ſound entire piece. This Operation *Smiths* call *Well Currying of the Steel.*

If there be Flaws in it, you muſt alſo take good Welding Heats, ſo hot, that the contiguous ſides of the Flaws may almoſt Run: for then, ſnatching it quickly out of the Fire, you may labour it together till it become cloſe and ſound.

Mr. *Robinſon*, a *Black-Smith* of *Oxford*, told me a way he uſes that is ingenious, and ſeems rational: For if he doubts the Steel may have ſome ſmall Flaws that he can ſcarce diſcern, he takes a good high Blood-Red Heat of it, and then twiſts the Rod or Bar (as I ſhewed, *Numb.* 3. *Vol.* I.) which Twiſting winds the Flaws about the Body of the Rod, and being thus equally diſpoſed, more or leſs, into the Out-ſides of the Rod, according as the Poſition of the Flaw may be, allows an equal Heat on all ſides to be taken, becauſe the Out-ſides heat faſter than the In-ſide; and therefore the Out-ſides of the Steel are not thus ſo ſubject to Burn, or Run, as if it ſhould be kept in the Fire till the Middle, or In-ſide of it ſhould be ready to Run. And when the Steel is thus well welded, and ſoundly laboured and wrought together with proper Heats, he afterwards reduces it to Form.

Now, that I may be the better underſtood by my Reader as he reads further, I have, in *Plate* 10. at *Fig.* G deſcribed the ſeveral Parts of the *Punch*; which I here explain.

G The Face.

a a, *b b* The Thickneſs.

a b, *a b* The Heighth.

a c, *b c*, *b c* The Length of the Shank, about an Inch and three quarters long.

c c c The Hammer-End.

This is no ſtrict Length for the Shank, but a convenient Length; for ſhould the Letter Cut on the Face be ſmall, and conſequently, the Shank ſo too, and the Shank much longer, and it (as ſeldom it is) not Temper'd in the middle, it might, with Punching into Copper, bow in the middle, either with the weight of the Hammer, or with light reiterated Blows: And ſhould it be much ſhorter, there might perhaps Finger-room be wanting to manage and command it while it is Punching into the Copper. But this Length is long enough for the biggeſt Letters, and ſhort enough for the ſmalleſt Letters.

The Heighth and Thickneſs cannot be aſſign'd in general, becauſe of the diverſity of Bodies, and Thickneſs of Letters: Beſides, ſome Letters muſt be Cut on a broad Face of Steel, though, when it is Cut, it is of the ſame Body; as all Letters are, to which *Counter-Punches* are uſed; becauſe the Striking the *Counter-Punch* into the Face of the *Punch* will, if it have not ſtrength enough to contain it, break or crack one or more ſides of the *Punch*, and ſo ſpoil it. But if the Letter be wholly to be Cut, and not Counter-Punch'd, as I ſhall hereafter hint in general what Letters are not, then the Face of the *Punch* need be no bigger, or, at leaſt, but a ſmall matter bigger than the Letter that is to be cut upon it.

Now, If the Letter be to be Counter-punch'd, the Face of the *Punch* ought to be about twice the Heighth, and twice the Thickneſs of the Face of the *Counter-Punch*; that ſo, when the *Counter-Punch* is ſtruck juſt on the middle of the Face of the *Punch*, a convenient Subſtance, and conſequently, Strength of Steel on all its Sides may be contained to reſiſt the Delitation, that the Sholder or Beard of the *Counter-Punch* ſinking into it, would elſe make.

If the *Letter-Cutter* be to Cut a whole Set of *Punches* of the ſame Body of *Roman* and *Italica*, he provides about 240 or 260 of theſe *Punches*, becauſe ſo many will be uſed in the *Roman* and *Italica Capitals* and *Lower-Caſe*, *Double-Letters*, *Swaſh-Letters*, *Accented Letters*, *Figures*, *Points*, *&c.* But this number of *Punches* are to have ſeveral Heighths and Thickneſſes, though the Letters to be Cut on them are all of the ſame Body.

What Heighth and Thickneſs is, I have ſhewed before in this §, but not what Body is; therefore I ſhall here explain it.

By Body is meant, in *Letter-Cutters*, *Founders* and *Printers* Language, the Side of the Space contained between the Top and Bottom Line of a Long Letter. As in the Draft of Letters, the divided Line on the Left Hand of A is divided into forty and two equal Parts; and that Length is the Body, thus: J being an Aſcending and Deſcending Letter, *viz.* a long Letter, ſtands upon forty two Parts, and therefore fills the whole Body.

There is in common Uſe here in *England*, about eleven Bodies, as I ſhewed in §. 2. ¶. 2. of this Volumne.

I told you even now, that all the *Punches* for the ſame Body muſt not have the ſame Heighth and Thickneſs: For ſome are Long; as, J j Q, and ſeveral others; as you may ſee in the Drafts of Letters: and theſe long Letters ſtand upon the whole Heighth of the Body.

The Aſcending and Deſcending Letters reach from the Foot-Line, up to the Top-Line; as all the Capital Letters are Aſcending Letters, and ſo are many of the Lower-Caſe Letters; as, b d f, and ſeveral others. The Deſcending Letters are of the ſame Length with the Aſcending Letters; as, g p q and ſeveral others. Theſe are contained between the Head-Line and the Bottom-Line. The Short Letters are contained between the Head-Line and the Bottom-line. Theſe are three different Sizes of Heighth the *Punches* are made to, for Letters of the ſame Body. But in proper place I ſhall handle this Subject more large and diſtinctly.

And as there is three Heighths or Sizes to be conſidered in Letters Cut to the ſame Body, ſo is there three Sizes to be conſidered, with reſpect to the Thickneſſes of all theſe Letters, when the *Punches* are to be Forged: For ſome are m thick; by m thick is meant m *Quadrat* thick, which is juſt ſo thick as the Body is high: Some are n thick; that is to ſay, n *Quadrat* thick, *viz.* half ſo thick as the Body is high: And ſome are *Space* thick; that is, one quarter ſo thick as the Body is high; though Spaces are ſeldom Caſt ſo thick, as ſhall be ſhewed when we come to *Caſting:* and therefore, for diſtinction ſake, we ſhall call theſe Spaces, Thick Spaces.

The firſt three Sizes fit exactly in Heighth to all the Letters of the ſame Body; but the laſt three Sizes fit not exactly in Thickneſs to the Letters of the ſame Body; for that ſome few among the Capitals are more than m thick, ſome leſs than m thick, and more than n thick; and ſome leſs than n thick, and more than Space thick; yet for Forging the *Punches*, theſe three Sizes are only in general Conſidered, with Exception had to Æ *Æ* *Q*, and moſt of the Swaſh Letters; which being too thick to ſtand on an m, muſt be Forged thicker, according to the Work-man's Reaſon.

After the Work-man has accounted the exact number of Letters he is to Cut for one Set, he conſiders what number he ſhall uſe of each of theſe ſeveral Sizes in the *Roman*, and of each of theſe ſeveral Sizes in the *Italick*; (for the *Punches* of *Romans* and *Italicks*, if the Body is large, are not to be Forged to the ſame ſhape, as ſhall be ſhewed by and by) and makes of a piece of Wood one Pattern of the ſeveral Sizes that he muſt have each number Forged to. Upon every one of theſe Wooden Patterns I uſe to write with a Pen and Ink the number of *Punches* to be Forged of that Size, leſt afterwards I might be troubled with Recollections.

I ſay (for Example) He conſiders how many long Letters are m thick, how many long Letters are n thick, and how many long Letters are Space thick, in the *Roman*; and alſo conſiders which of theſe muſt be Counter-punch'd, and which not: For (as was ſaid before) thoſe Letters that are to be Counter-punch'd are to have about twice the Heighth and twice the Thickneſs of the Face of the *Counter-Punch*, for the Reaſon aforeſaid. But the Letters not to be Counter-punch'd need no more Subſtance but what will juſt contain the Face of the Letter; and makes of theſe three Sizes three Wooden Patterns, of the exact Length, Heighth and Thickneſs that the Steel *Punches* are to be Forged to.

He alſo counts how many are Aſcendents and Deſcendents, m-thick, n-thick, and Space thick; ſtill conſidering how many of them are to be Counter-punch'd, and how many not; and makes Wooden Patterns for them.

The like he does for ſhort Letters; and makes Wooden Patterns for them, for Steel *Punches* to be Forged by.

And as he has made his Patterns for the *Roman*, ſo he makes Patterns for the *Italick* Letters alſo; for the ſame ſhap'd *Punches* will not ſerve for *Italick*, unleſs he ſhould create a great deal more Work to himſelf than he need do: For *Italick Punches* are not all to be Forged with their ſides ſquare to one another, as the *Romans* are; but only the higheſt and loweſt ſides muſt ſtand in Line with the higheſt and loweſt ſides of the *Roman*; but the Right and Left Hand ſides ſtand not parallel to the Stems of the *Roman*, but muſt make an Angle of 20 Degrees with the *Roman* Stems: ſo that the Figure of the Face of the *Punch* will become a *Rhomboides*, as it is called by *Geometricians*, and the Figure of this Face is the Slope that the *Italick* Letters have from the *Roman*, as in proper place ſhall be further ſhewed. Now, ſhould the *Punches* for theſe Letters be Forged with each ſide ſquare to one another, the *Letter-Cutter* would be forced to ſpend a great deal of Time, and take great pains to File away the ſuperfluous Steel about the Face of the Letter when he comes to the Finiſhing of it, eſpecially in great Bodied Letters. Yet are not all the *Italick* Letters to be Forged on the Slope; for the *Punches* of ſome of them, as the *m n*, and many others, may have all, or, at leaſt, three of their ſides, ſquare to one another, though their Stems have the common Slope, becauſe the ends of their Beaks and Tails lie in the ſame, perpendicular with the Outer Points of the Bottom and Top of their Stems, as is ſhewed in the Drafts of Letters.

Though I have treated thus much on the Forging of Punches, yet muſt all what I have ſaid be underſtood only for great Bodied *Punches*; *viz.* from the *Great Primer*, and upwards. But for ſmaller Bodies; as *Engliſh*, and downwards, the *Letter-Cutter* generally, both for *Romans* and *Italicks*, gets ſo many ſquare Rods of Steel, Forged out of about two or three Foot in Length, as may ſerve his purpoſe; which Rods he elects as near his Body and Sizes as his Judgment will ſerve him to do; and with the edge of a Half-round File, or a Cold-Chiſſel, cuts them into ſo many Lengths as he wants *Punches*. Nay, many of theſe Rods may ſerve for ſome of the ſmall Letters in ſome of the greater Bodies; and alſo, for many of their *Counter-Punches*.

Having thus prepared your *Punches*, you muſt Neal them, as I ſhewed in *Numb.* 3. *Vol.* I.

¶. 2. *Of* Counter-Punches.

The *Counter-Punches* for great Letters are to be Forged as the *Letter-Punches*; but for the ſmaller Letters, they may be cut out of Rods of Steel, as aforeſaid. They muſt alſo be well Neal'd, as the *Punches*. Then muſt one of the ends be Filed away on the out-ſide the Shank, to the exact ſhape of the in-ſide of the Letter you intend to Cut. For Example, If it be *A* you would Cut; This *Counter-Punch* is eaſie to make, becauſe it is a Triangle; and by meaſuring the In-ſide of the Angle of *A* in the Draft of Letters, as you were taught, §. 12. ¶. 6. you may make on your Standing *Gage-Plate* a *Gage* for that Angle: So that, let the Letter to be Cut be of what Body you will, from the leaſt, to the biggeſt Body, you have a Standing *Gage* for this *Counter-Punch*, ſo oft as you may have occaſion to Cut A.

The *Counter-Pnnch* of *A* ought to be Forged Triangularly, eſpecially towards the Punching End, and Tryed by the *A Gage*, as you were taught to uſe the Square, *Numb.* 3. *Vol.* I. Yet, for this and other Triangular *Punches*, I commonly reſerve my worn out three ſquare Files, and make my *Counter-Punch* of a piece of one of them that beſt fits the Body I am to Cut.

Having by your *A-Gage* fitted the Top-Angle and the Sides of this *Counter-Punch*, you muſt adjuſt its Heighth by one of the three *Face-Gages* mentioned in § 12. ¶. 5. *viz.* by the Aſcending *Face-Gage*; for *A* is an Aſcending Letter. By Adjuſting, I do not mean, you muſt make the *Counter-Punch* ſo high, as the Depth of the Aſcending *Face-Gage*; becauſe in this Letter here is to be conſidered the Top and the Footing, which ſtrictly, as by the large Draft of *A*, make both together five ſixth Parts of a thin Space: Therefore five ſixth Parts muſt be abated in the Heighth of your *Counter-Punch*, and it muſt be but four thin Spaces, and one ſixth part of a thin

Space high, becauſe the Top above the *Counter-Punch*, and the Footing below, makes five ſixth Parts of a thin Space, as aforeſaid.

Therefore, to meaſure off the Width of four thin Spaces and one ſixth Part of a thin Space, lay three thin Spaces, or, which is better, the Letter e, which is three thin Spaces, as aforeſaid; and . which is one thin Space and one ſixth part of a thin Space, upon one another; for they make together, four thin Spaces, and one ſixth part of a thin Space; and the thickneſs of theſe two Meaſures ſhall be the Heighth of the *Counter-Punch*, between the Footing and the Inner Angle of *A*. And thus, by this Example, you may couple with proper Meaſures either the whole Forty two, which is the whole Body, or any number of its Parts, as I told you before.

This Meaſure of four thin Spaces and one ſixth part of a thin Space is not a Meaſure, perhaps, uſed more in the whole Set of Letters to be Cut to the preſent Body, therefore you need not make a *Standing Gage* for it; yet a preſent *Gage* you muſt have: Therefore uſe the *Sliding Gage* (deſcribed in §. 12. ¶. 4. and *Plate* 10. at B.) and move the Socket *c c* on the Beam *a a*, till the Edge of the Sholder of the Square of the Socket at the under-ſide of the Beam ſtands juſt the Width of four thin Spaces and one ſixth part of a thin Space, from the Point of the Tooth *b*; which you may do by applying the Meaſure aforeſaid juſt to the Square and Point of the Tooth; for then if you Screw down the Screw in the upper ſide of the Sliding Socket, it will faſten the Square at that diſtance from the Point of the

Tooth. And by again applying the ſide of the Square to the Foot of the Face of the *Counter-Punch*, you may with the Tooth deſcribe a ſmall race, which will be the exact Heighth of the *Counter-Punch* for *A*. But *A* hath a Fine ſtroak within it, reaching from Side to Side, which by the large Draft of *A*, you may find that the middle of this croſs ſtroak is two Thin Spaces above the bottom of this *Counter-Punch*; and with your common *Sliding-Gage* meaſure that diſtance as before, and ſet off that diſtance alſo on the Face of your *Counter-Punch*. Then with the edge of a Fine *Knife-File*, File ſtraight down in that race, about the depth of a Thin Space, or ſomewhat more; So ſhall the *Counter-Punch* for *A* be finiſht. But you may if you will, take off the Edges or Sholder round about the Face of the *Counter-Punch*, almoſt ſo deep as you intend to ſtrike it into the *Punch*: for then the Face of the *Counter-Punch* being Filed more to a Point, will eaſier enter the *Punch* than the broad Flat-Face.

But note, That if it be a very Small Bodied *A* you would make, the Edge of a Thin *Knife-File* may make too wide a Groove: In this caſe you muſt take a peece of a well-Temper'd broken Knife, and ſtrike its Edge into the Face of the *Counter-Punch*, as aforeſaid.

¶. 3. *Of Sinking the* Counter-Punches.

Having thus finiſht his *Counter-Punch*, he Hardens and Tempers it, as was taught *Numb.* 3. *fol.* 57, 58. *Vol.* I. And having alſo Filed the Face of his Punch he intends to cut his *A* upon, pretty Flat by gueſs, he Screws the Punch upright, and hard into the Vice: And ſetting the Face of his *Counter-Punch* as exactly as he can, on the middle of the Face of his Punch, he, with an Hammer ſuitable to the Size of his *Counter-Punch*, ſtrikes upon the end of the *Counter-Punch* till he have driven the Face of it about two Thin Spaces deep into the Face of the Punch. So ſhall the *Counter-Punch* have done its Office.

But if the Letter to be *Counter-Puncht* be large, as *Great Primmer*, or upwards, I take a good high Blood red Heat of it, and Screw it quickly into the Vice; And having my *Counter-Punch* Hard, not Temper'd, becauſe the Heat of the Punch ſoftens it too faſt: And alſo having before-hand the *Counter-Punch* Screwed into the *Hand-Vice* with its Shank along the Chaps, I place the Face of the *Counter-Punch* as before, on the middle of the Face of the Punch, and with an Hammer drive it in, as before.

Taking the Punch out of the Vice, he goes about to Flat and Smoothen the Face in earneſt; for it had been to no purpoſe to Flat and Smoothen it exactly before, becauſe the Sinking of the *Counter-Punch* into it, would have put it out of Flat again.

But before he Flats and Smoothens the Face of the Punch, He Files by gueſs the ſuperfluous Steel away about the Face of the Letter, *viz.* ſo much, or near ſo much, as is not to be uſed when he comes to finiſh up the Letter, as in this preſent Letter *A*, which ſtanding upon a Square Face on the Punch, meets in an Angle at the Top of the Letter. Therefore the Sides of that Square muſt be Filed away to an Angle at the Top of the Face of the Punch. But great care muſt be taken, that he Files not more away than he ſhould: For he conſiders that the left hand Stroak of *A* is a Fat Stroak, and that both the left-hand and the right-hand Stroak too, have Footings, which he is careful to leave Steel enough in their proper places for.

The reaſon why theſe are now Fil'd thus away, and not after the Letter is finiſht, is, Becauſe in the Flatting the Face there is now a leſs Body of Steel to File away, than if the whole Face of the Punch had remain'd intire: For though the following ways are quick ways to Flatten the Face, yet conſidering how tenderly you go to Work, and with what Smooth Files this Work muſt be done, the riddance made will be far leſs when a broad Face of *Steel* is to be Flatned, than when only ſo much, or very little more than the Face of the *Letter* only is to be Flatned.

To Flat and Smoothen the Face of the Punch, he uſes the *Flat-Gage*, (deſcribed §. 12. ¶. 3. and *Plate* 10. at A.) thus, He fits one convex corner of the Shank of the Punch, into the Concave corner of the *Flat-Gage*, and ſo applies his *Flat-Gage-Punch* and all to the Face of the *Uſing-File*, and lets the *Counter-Puncht* end, *viz.* the Face of the Punch Sink down to the Face of the *Uſing-File*: And then keeping the convex Corner of the Shank of the Punch cloſe and ſteddy againſt the Concave corner of the *Flat-Gage*, and preſſing with one of his Fingers upon the then upper end of the Punch, *viz.* the Hammer-end, he alſo at the ſame time, preſſes

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the lower end of the Punch, *viz.* The Face againſt the *Uſing-File*, and thruſts the *Flat-Gage* and *Punch* in it ſo oft forwards, till the extuberant Steel on the Face, be Rub'd or Fil'd away: which he knows partly by the alteration of colour and Fine Furrows made by the *Uſing-File* on the Face of the Punch, and partly by the falling away of the parts of the Face that are not yet toucht by the *Uſing-File*: So that it may be ſaid to be truly Flat: which he knows, when the whole Face of the Punch touches upon the Flat of the *Uſing-File*, or at leaſt, ſo much of the Face as is required in the Letter: For all Counter-Puncht-Letters, as aforeſaid, muſt have a greater Face of Steel than what the bare Letter requires: for the reaſon aforeſaid.

Another way I uſe is thus. After I have Fil'd the Face as true as I can by gueſs, with a *Rough-Cut-File*, I put the Punch into an Hand-Vice, whoſe Chaps are exactly Flat, and ſtraight on the upper Face, and ſink the Shank of the Punch ſo low down in the Chaps of the Hand-Vice, that the low ſide of the Face of the Punch may lye in the ſame Plain with the Chaps; which I try with the Liner. For the Liner will then ſhew if any of the Sides ſtand higher than the Plain of the Chaps: Then I Screw the Punch hard up, and File off the riſing ſide of the Punch, which brings the Face to an exact Level: For the Face of the Chaps being Hard Steel, a File cannot touch them, but only take off the aforeſaid Riſing parts of the Face of the Punch, till the *Smooth-File* has wrought it all over exactly into the ſame Plain with the Face of the Chaps of the *Hand-Vice.*

Some *Letter-Cutters* work them Flat by Hand, which is not only difficult, but tedious, and at the beſt, but done by gueſs.

The inconvenience that this Tool is ſubject to, is, That with much uſing its Face will work out of Flat. Therefore it becomes the Workman to examine it often, and when he finds it faulty to mend it.

When they *File* it Flat by Hand, they Screw the Shank of the Punch perpendicularly upright into the Chaps of the Vice, and with a *Flat-Baſtard-Cut-File*, of about Four Inches long, or if the Punch be large, the File larger, according to diſcretion, and File upon the Face, as was ſhewn *Numb.* I. *fol.* 15, 16. Then they take it out of the Vice again, and holding up the Face Horizontally between the Sight and the Light, examine by nice obſerving whether none of its Angles or Sides are too high or too low. And then Screwing it in the Vice again, as before, with a *Smooth-Cut-File*, he at once both Files down the Higher Sides or Angles, and Smoothens the Face of the Punch. But yet is not this Face ſo perfectly Flatned, but that perhaps the middle of it riſes more or leſs, above the Sides: And then he Screws it in his *Hand-Vice*, and leans the Shank of the Punch againſt the Tach, pretty near upright, and ſo as he may beſt command it, and with a *Watch-Makers Half-Round-Sharp-Cut-File*, Files upon it with the Flat-Side of his File; But ſo that he ſcarce makes his forward and backward Stroaks longer than the breadth of the Face of his Punch, leſt in a long Stroak, the hither or farther end of his File ſhould Mount or Dip, and therefore keeps his File, with the Ball of his Finger upon it, cloſe to the Face of the Punch. Then with the Liner he examines how Flat the Face of the Punch is, and if it be not yet Flat, as perhaps it will not be in ſeveral Trials, he again reiterates the laſt proceſs with the *Small-Half-Round-File*, till it be Flat. But he often Files croſs the Furrows of the File, as well becauſe it makes more riddance, as becauſe he may better diſcern how the File bears on the Face of the Punch.

When it is Flat, he takes a Small well-worn Half-Round-File, and working (as before) with the *Sharp-Cut-File*, he Smoothens the Face of the Punch.

Having thus Flatted the Face of the Punch, and brought the Letter to ſome appearance of Form, He Screws the Punch in the Hand-Vice, but not with the Shank perpendicular to the Chaps, but ſo as the Side he intends to File upon may ſtand upwards and aſlope too, and make an Angle with the Chaps of the Hand-Vice. And holding the Hand-Vice ſteddy in his left hand, he reſts the Shank of the Punch pretty near its Face upon the Tach: and then with a ſmall *Flat-File*, called a *Pillar-File*, in his right hand, holding the Smooth Thin Side of it towards the Footing of the Stem, he Files that Stem pretty near its due Fatneſs, and ſo by ſeveral reiterated proffers, leſt he ſhould File too much of the Stem away, he brings that Stem at laſt to its true Fatneſs. Then he meaſures with the Aſcending *Face-Gage*, the Heighth of the Letter: For though the *Counter-Punch* was imagin'd

(as aforeſaid) to be made to an exact Heighth for the inſide of the Letter ; yet with deeper or ſhallower Sinking it into the *Punch*, the inſide oft proves higher or lower: Becauſe, as aforeſaid, the Superficies of the Face of the *Counter-Punch* is leſs than the true meaſure. But as it runs Sholdering into the Shank of the *Counter-Punch* the Figure or Form of the inſide becomes bigger than the inſide of the Letter ought to be. Therefore the deeper this Sholdering Shank is ſunk into the Face of the *Punch*, the higher and broader will the Form of the inſide of the Letter be, and the ſhallower it is Sunk in, the Shorter and Narrower by the Rule of Contraries.

He meaſures, as I ſaid, with the Aſſending Face-Gage, and by it finds in what good Size the Letter is. If it be too high, as moſt commonly it is, becauſe the Footing and Top are yet left Fat, then with ſeveral proffers he Files away the Footing and Top, bringing the Heighth nearer and nearer ſtill, conſidering in his Judgment whether it be propereſt to File away on the Top or Footing, till at laſt he fits the Heighth of the Letter by the Aſſending *Face-Gage*.

But though he have fitted the Heighth of the Letter, yet if the *Counter-Punch* were made a little too little, or Sunk a little too ſhallow, not only the Footing will prove too Fat, but the Triangle above the Croſs-ſtroke of *A* will be too ſmall ; or if too big, the Footing and part of the Top will be Filed away, when it is brought to a due Heighth, and then the Letter is Spoil'd, unleſs it be ſo deep Sunk, that by working away the Face, as aforeſaid, he can regain the Footing and Top through the Slope-ſholdering of the *Counter-Punch*,and alſo keep the inſide of the Letter deep enough.

But if the Footing be too *Fat* or the Triangle of the Top too little in the Inſide, he uſes the Knife-backt Sculpter, and with one of the edges or both, that proceeds from the Belly towards the Point of the Sculpter (which edges we will for diſtinction ſake call *Angular edges*) he by degrees and with ſeveral proffers Cuts away the Inſide of the Footing, or opens the Triangle at the Top or both, till he hath made the Footing lean enough, and the Triangle big enough.

But if he works on the Triangle of the Top, he is careful not to Cut into the Straight of the Inſide lines of the Stems, but to keep the Inſides of that Triangle in a perfect ſtraight line with the other part of the Inſide of the Stem.

The ſmall arch of a Circle on the Top of *A* is Fil'd away with a Sizable Round-File. And ſo for all other Letters that have Hollows on their Outſides; he fits himſelf with a ſmall File of that ſhape and Size that will fit the Hollow that he is to work upon: For thus the Tails of Swaſh Letters in Italick Capitals are Fil'd with half Round Files Sizable to the Hollows of them. But I inſtead of Round or Half-Round Files,in this Caſe,beſpeak Pillar Files of ſeveral Thickneſſes, and cauſe the *File-maker* to Round and Hatch the Edges: which renders the File ſtrong and able to endure hard leaning on, without Breaking, which Round or Half-Round Files will not Bear.

I need give no more Examples of Letters that are to be Counter-punched: And for Letters that need neither Counter-punching or Graving, they are made as the Out-ſides of *A*, with Files proper to the ſhapes of their Stroaks.

¶. 4. *Of Graving and Sculping the Inſides of* Steel Letters.

The *Letter-Cutter* elects a *Steel Punch* or *Rod*, a ſmall matter bigger than the Size of the Letter he is to Cut; becauſe the Topping or Footing Stroaks will be ſtronger when they are a little Bevell'd from the Face. The Face of theſe Letters not being to be Counter-punched are firſt Flatned and Smoothed, as was ſhewed, ¶. 3. Then with the proper *Gage*, *viz.* the Long, the Aſcending, or elſe the Short *Face-Gage*, according as the Letter is that he intends to Cut, He meaſures off the exact Heighth of the Letter, Thus; He firſt Files one of the Sides of the Face of the *Punch* (*viz.* that Side he intends to make the Foot of his Letter) exactly ſtraight; which to do, he ſcrews his *Punch* pretty near the bottom end, with its intended Foot-ſide uppermoſt, aſlope into one end of the Chaps of his *Hand-Vice*. So that the Shank of the *Punch* lies over the Chaps of the *Hand-Vice*, and makes an Angle of about 45 Degrees with the Superficies of the Chaps of it: Then he lays the under ſide of the Shank of his *Punch* aſlope upon his *Tache*, in one of the Notches of it, that will beſt fit the ſize of his *Punch*, to keep it ſteady; and ſo Files the Foot-Line of the *Punch*.

But he Files not athwart the ſides of his *Punch*; for that might make the Foot-Line Roundiſh, by a Mounting and Dipping the Hand is prone to; as I ſhewed, *Vol.* I. *Fol.* 15, 16. But he holds his File ſo as the Length of it may hang over the Length of the Shank of the *Punch*, and dip upon it at the Face of the *Punch*, with a Bevel, or Angle, of about 100 Degrees with the Face of the *Punch*. This Angle you may meaſure with the *Beard-Gage*, deſcribed in *Plate* 10. *Fig.* C. at *k*. Then Filing with the File in this Poſition, the Foot-Line will be made a true ſtraight Line. But yet he examines it too by applying the *Liner* to it; and holding the *Punch* and *Liner* thus to the Light; If the *Liner* touches all the way on the Foot-Line, he concludes it true; if not, he mends it till it do.

Then he uſes his proper *Steel-Gage*, and places the Sholder of it againſt the Shank of the *Punch* at the Foot-Line; and preſſing the Sholder of the *Steel-Gage* cloſe againſt the Foot-Line, he, with the Tooth of the *Gage* makes a Mark or Race on the ſide of the Face, oppoſite to the Foot-line: And that Mark or Race ſhall be from the Foot-Line, the Bounds of the Heighth of that Letter.

Then on the Face he draws or marks the exact ſhape of the Letter, with a Pen and Ink if the Letter be large, or with a ſmooth blunted Point of a Needle if it be ſmall: Then with ſizable and proper ſhaped and Pointed Sculptors and Gravers, digs or Sculps out the Steel between the Stroaks or Marks he made on the Face of the *Punch*, and leaves the Marks ſtanding on the Face.

If the Letter be great he is thus to Sculp out, he then, with a Graver, Cuts along the Inſides of the drawn or marked Stroaks, round about all the Hollow he is Cutting in. And having Cut about all the ſides of that Hollow, he Cuts other ſtraight Lines within that Hollow, cloſe to one another (either parallel or aſlope, it matters not) till he have filled the Hollow with ſtraight Lines; and then again, Cuts in the ſame Hollow, athwart thoſe ſtraight Lines, till he fill the Hollow with Thwart Lines alſo. Which ſtraight Lines, and the Cuttings athwart them, is only to break the Body of Steel that lies on the Face of the *Punch* where the Hollow muſt be; that ſo the Round-Back'd Sculptor may the eaſier Cut through the Body of the Steel, in the Hollow, on the Face of the *Punch*; even as I told you, *Numb.* 4. *Vol*, I. §. 2. the Fore-Plain makes way for the Fine Plains.

The *Letter-Cutter* does not expect to perform this Digging or Sculping at one ſingle Operation; but, having brought the Inſide of his Letter as near as he can at the firſt Operation, he, with the flat ſide of a Well-worn, Small, Fine-Cut, Half-round File, Files off the Bur that his Sculptors or Gravers made on the Face of the Letter, that he may the better and nicelier diſcern how well he has begun. Then he again falls to work with his Sculptors and Gravers, mending, as well as he can, the faults he finds; and again Files off the Bur as before, and mends ſo oft, till the Inſide of his Letter pleaſes him pretty well. But before every Mending he Files off the Bur, which elſe, as aforeſaid, would obſcure and hide the true ſhape of his Stroaks.

Having well ſhaped the Inſide Stroaks of his Letter, he deepens the Hollows that he made, as well as he can, with his Sculptors and Gravers: And the deeper he makes theſe Hollows, the better the Letter will prove. For if the Letters be not deep enough, in proportion to their Width, they will, when the Letter comes to be Printed on, Print Black, and ſo that Letter is ſpoiled.

How deep theſe Hollows are to be, cannot be well aſſerted, becauſe their Widths are ſo different, both in the ſame Letter, and in ſeveral Letters: Therefore he deepens them according to his Judgment and Reaſon. For Example, O muſt be deeper than A need be, becauſe the Hollow of O is wider than the Hollow of A; A having a Croſs Stroak in it; and the wider the Hollow is, the more apt will the wet Paper be to preſs deeper towards the bottom in Printing. Yet this in General for the Depth of Hollows; You may make them, if you can, ſo deep as the *Counter-Punch* is directed to be ſtruck into the Face of the Punch. See ¶. 3. of this §.

Having with his Gravers and Sculptors deepned them ſo much as he thinks convenient, he, with a *Steel Punch*, pretty near fit to the ſhape and ſize of the Hollow, and Flatted on its Face, Flattens down the Irregularities that the Gravers or Sculptors made, by ſtriking with a proper Hammer, upon the Hammer-end of the *Punch*, with pretty light blows. But he takes great care, that this *Flat-Punch* be not at all too big for the Hollow it is to be ſtruck into, leſt it force the ſides of the Stroaks of the Letter out of their ſhape: And therefore alſo it is, that he ſtrikes but eaſily, though often, upon the end of the *Flat-Punch.*

Having finiſhed the Inſide, he works the Outſides with proper Files; as I ſhewed before, in Letter A; and ſmoothens and Polliſhes the Outſide Stroaks and Face with proper worn-out ſmall *Watch-makers* Files.

The Inſide and Outſide of the Face thus finiſhed, he conſiders what Sholdering the Shank of the *Punch* makes now with the Face, round about the Letter. For, as the Shank of the Letter ſtands farther off the Face of any of the Stroaks, the Sholdering will be the greater when the Letter is firſt made; becauſe the Outſides of the Letter, being only ſhaped at firſt with Fine Small Files, which take but little Steel off, they are Cut Obtuſely from the Shank to the Face, and the Steel of the Shank may with Rougher Files afterwards, be Cut down more Tapering to the Shank. For the Sholder of the Shank, as was ſaid before in this ¶, muſt not make an Angle with the Face, of above 100 Degrees; becauſe elſe they would be, firſt, more difficult to Sink into Copper; And Secondly, The broad Sholders would more or leſs (when the Letter is Caſt in ſuch Matrices) and comes to the Preſs, be ſubject, and very likely to be-ſmear the Stroaks of the Letter; eſpecially, with an Hard Pull, and too wet Paper; which ſqueezes the Face of the Letter deep into the Paper, and ſo ſome part of the Broad Sholdering of the Letter, receiving the Ink, and preſſing deep into the Paper, ſlurs the Printed Paper, and ſo makes the whole Work ſhew very naſty and un-beautiful.

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For theſe Reaſons it is, that the Shank of the *Punch*, about the Face, muſt be Filed away (at leaſt, ſo much as is to be Sunk into Copper) pretty cloſe to the Face of the Letter; yet not ſo as to make a Right Angle with the Face of the Letter, but an Obtuſe Angle of about 100 Degrees: For, ſhould the Shank be Filed away to a Right Angle, *viz.* a Square with the Face, if any Footing or Topping be on the Letter, theſe fine Stroaks will be more ſubject to break when the *Punch* is Sunk into Copper, than when the Angle of the Face and Shank is augmented; becauſe then thoſe fine Stroaks ſtand upon a ſtronger Foundation. Therefore he uſes the *Beard-Gage*, and with that examines round about the Letter, and makes the Face and Shank comply with that.

Yet Swaſh-Letters, eſpecially *Q*, whoſe Swaſhes come below the Foot-Line, and whoſe Length reaches under the Foot-Line of the next Letter, or Letters in Compoſing, ought to have the Upper Sholder of that Swaſh Sculped down ſtraight, *viz.* to a Right Angle, or Square with the Face; at leaſt, ſo much of it as is to be Sunk into Copper: Becauſe the Upper Sholder of the Swaſh would elſe be ſo broad, that it would ride upon the Face of the next Letter. Therefore the Swaſh-Letters being all Long Letters, the lower end of the Swaſhes reach as low as the Bottom-Line; which cannot be Filed Square enough down from the Head-Line, unleſs the Steel the Swaſh ſtands on, ſhould be Filed from end to end, the length of the whole Shank of the *Punch*, which would be very tedious; and beſides, would make that part of the Shank the Swaſh ſtands on ſo weak, that it would ſcarce endure Striking into the Copper. Therefore, as I ſaid before, the Upper Sholder of the Swaſh ought to be Sculped down: Yet I never heard of any *Letter-Cutters* that had the knack of doing it; but that they only Filed it as ſtraight down as they could, and left the *Letter-Kerner*, after the Letter was Caſt, to Kern away the Sholdering. Yet I uſe a very quick way of doing it; which is only by Reſting the Back of a Graver at firſt, to make way; and afterwards a Sculptor, upon the Shank of the *Punch*, at the end of the Swaſh, one while; and another while on the Shank, at the Head, that the Swaſh may be Sculped down from end to end: and Sculping ſo, Sculp away great Flakes of the Steel at once, till I have Cut it down deep enough, and to a Right Angle.

Then he Hardens and Tempers the Punch; as was ſhewed, *Numb.* 3. *Vol.* I. *Fol.* 57, 58.

But though the *Punch* be Hardned and Temper'd, yet it is not quite finiſhed: for, in the Hardning, the *Punch* has contracted a Scurf upon it; which Scurf muſt be taken off the Face, and ſo much of the ſides of the Shank as is to be Sunk into Copper. Some *Letter-Cutters* take this Scurf off with ſmall ſmooth Files, and afterwards with fine Powder of *Emerick*. The *Emerick* they uſe thus. They provide a Stick of Wood about two Handful long, and about a *Great-Primer*, or *Double-Pica* thick: Then in an Oyſter-ſhell, or any ſleight Concave thing, they powr a little Sallad-Oyl, and put Powder of *Emerick* to it, till it become of the Conſiſtence of Batter made for Pan-cakes. And ſtirring this Oyl and *Emerick* together, ſpread or ſmear the aforeſaid Stick with the Oyl and *Emerick*, and ſo rub hard upon the Face of the *Punch*, and alſo upon part of the the Shank, till they have taken the Scurf clean off.

Mr. *Walberger* of *Oxford* uſes another way. He makes ſuch an Inſtrument as is deſcribed in *Plate* 10. at H, which we will, for diſtinction ſake, call the *Joynt-Flat-Gage*. This Inſtrument conſiſts of two Cheeks about nine Inches long, as a b, and are faſtned together at one end, as the Legs of a *Carpenter's* Joynt-Rule are in the Centre, as at *c*, but with a very ſtrong Joynt; upon which Centre, or Joynt, the Legs move wider, or cloſer together, as occaſion requires. Each Leg is about an Inch and a quarter broad, and an Inch and three quarters deep; *viz.* ſo deep as the Shank of the *Punch* is long. At the farther end of the Shank b (as at *d*) is let in an Iron Pin, with an Head at the farther end, and a ſquare Shank, to reach almoſt through a ſquare Hole in the Shank b, that it twiſts not about; and at the end of that Square, a round Pin, with a Male-Screw made on it, long enough to reach through the Shank a, and about two Inches longer, as at *e*; upon which Male-Screw is fitted a Nut with two Ears, which hath a Female-Screw in it, that draws and holds the Legs together, as occaſion requires a bigger or leſs *Punch* to be held in a proper Hole. Through each of the adjoyning Inſides of the Legs are made, from the Upper to the Lower Side, ſix, ſeven, or eight Semi-Circular Holes (or more or leſs, according to diſcretion) exactly Perpendicular to the upper and under Sides of each Leg, marked *a a a a*, *b b b b.* Each of theſe Semicircular Holes is, when joyned to its Match, on the other Leg to make a Circular Hole; and therefore muſt be made on each Leg, at an equal diſtance from the Centre. Theſe Holes are not all of an equal Size, but different Sizes: Thoſe towards the Centre ſmalleſt, *viz.* ſo ſmall, that the *Punch* for the ſmalleſt Bodied Letters may be pinched faſt in them; and the biggeſt Holes big enough to contain, pinch and hold faſt the *Punches* for the great Bodied Letters. The upper and under ſides of this *Joynt-Flat-Gage* is Faced with an Iron Plate, about the thickneſs of an Half Crown, whoſe outer Superficies are both made exactly Flat and Smooth.

When he uſes it, he chuſes an Hole to fit the Size of the *Punch*; and putting the Shank of the *Punch* into that Hole, Sinks it down ſo low, till the Face of the *Punch*, ſtands juſt Level, or rather, above the Face of the *Joynt-Flat-Gage*: Then with a piece of an Hone, wet in Water, rubs upon the Face of the *Punch*, till he have wrought off the Scurf. At laſt, with a Stick and Dry *Putty*, Poliſhes it.

I like my own way better than either of the former: For, to take off the Scurf with Small Files ſpoils the Files; the Face of the *Punch* being Hard, and the Scurf yet Harder: And beſides, endangers the wronging the Face of the *Punch*.

The *Joynt-Flat-Gage* is very troubleſome to uſe, becauſe it is difficult to fit the Face of the *Punch*, to lie in the Plain of the Face of the *Gage*; eſpecially, if, in making the Letter, the Shank be Filed Tapering,

ing, as it moſt times is. For then the Hammer-end of the *Punch* being bigger than the Face-end, it will indeed Pinch at the Hammer-end, whilſt the Face-end ſtands unſteady to Work on. But when the *Punch* is fitted in, it is no way more advantagious for Uſe, than the Chaps of the *Hand-Vice* I mentioned in ¶. 3. of this §.

Wherefore, I fit the *Punch* into the Chaps of the *Hand-Vice*, as I ſhewed in the aforeſaid ¶. and with a fine ſmooth Whet-ſtone and Water, take the Scurf lightly off the Face of the *Punch*; and afterwards, with a fine ſmooth Hone and Water, work down to the bare bright Steel. At laſt, drying the *Punch* and Chaps of the *Hand-Vice* with a dry Rag, I poliſh the Face of the *Punch* with Powder of Dry *Brick* and a Stick, as with *Putty*.

¶. 5. *Some Rules he conſiders in uſing the* Gravers, Sculptors, Small Files, *&c.*

1. When he is Graving on the Inſide of the Stroak, either to make it Finer or Smoother, he takes an eſpecial care that he place his Graver or Sculptor ſo, as that neither of its Edges may wrong another Stroak of the Letter, if they chance (as they often do) to ſlip over, or off an extuberant part of the Stroak he is Graving upon. And therefore, I ſay, he well conſiders how he is to manage the edges of his Graver. For there is no great danger of the point of his Graver after the inſide Stroaks are form'd, and the Hollows of the Letter ſomewhat deepned; but in the edges there is: For the point

in working lies always below the Face of the Letter, and therefore can, at moſt, but ſlip below the Face, against the ſide of the next Stroak; but the edges lying above the Face of the Letter, may, in a ſlip, touch upon the Side and Face of the next Stroak, and wrong that more or leſs, according as the force of the Slip was greater or ſmaller. And if that Stroak it jobs againſt were before wholly finiſhed, by that job the whole Letter is in danger to be ſpoiled; at the beſt, it cannot, without Filing the Letter lower, be wrought out; which ſometimes is a great part of doing the Letter anew: For he takes ſpecial care that neither any dawk, or the leaſt extuberant bunching out be upon the inſide of the Face of the Stroak, but that the inſide of the Stroak (whether it be Fat or Lean) have its proper Shape and Proportion, and be purely ſmooth and clean all the way.

If on the inſide of the Stroak the Graver or Sculptor have not run ſtraight and ſmooth on the Stroak, but that an Extuberance lies on the Side, that Extuberance cannot eaſily be taken off, by beginning to Cut with the Edge of the Graver or Sculptor juſt where the Extuberance begins: Therefore he fixes the Point of his Graver or Sculptor in the Bottom of the Hollow, juſt under the Stroak where the Extuberance is, and leans the Edge of his Graver or Sculptor upwards; ſo as in forcing the Point of the Graver or Sculptor forwards, at the Bottom of the Hollow, the Edge of the Graver or Sculptor may ſlide tenderly along, and take along with it a very ſmall, nay, inviſible Chip of the moſt Prominent Part of the Extuberance; and ſo, by this Proceſs reitterated often, he, by ſmall Degrees, Cuts away the Extuberant part of the Stroak.

2. He is careful to keep his Gravers and Sculptors always Sharp, by often Sharpning them on the Oyl-Stone, which for that purpoſe he keeps ready at hand, ſtanding on the Bench: For if a Graver or Sculptor be not ſharp, it will neither make riddance, or Cut ſmooth; but inſtead of Cutting off a ſmall Extuberancy, it will rather ſtick at it, and dig into the Side of the Stroak.

3. He Files very tenderly with the Small Files, eſpecially with the Knife-Files, as well becauſe they are Thin and Hard, not Temper'd, and therefore would ſnap to pieces with ſmall violence; as alſo, leſt with an heavy hand he ſhould take away too much at once of that Stroak he is working upon.

§. 14. ¶. 1. *Some Rules to be obſerved by the* Letter-Cutter, *in the Cutting* Roman, Italick, *and the* Black Engliſh Letter.

1. The Stem and other Fat Stroaks of Capital *Romans* is five Parts of forty and two (the whole Body:) Or, (which is all one) one ſixth part of the Heighth of an Aſcending Letter (as all Capitals are Aſcendents) as has been ſaid[e] before. *Albertus Durer* took his Meaſure from the Heighth of Capitals, and aſſigned but one tenth part for the Stem.

2. The Stem, and other Fat Stroaks of Capitals *Italick*, is four parts of forty and two, (the Body.)

3. The Stem, and other Fat Stroaks of Lower-Caſe *Roman*, is three and an half parts of forty and two, (the Body.)

4. The Stem, and other Fat Stroaks of Lower-Caſe *Italick*, is three parts of forty and two, (the Body.)

5. Of *Engliſh*, the Short Letters ſtand between nine parts of the Bottom-Line, and nine parts from the Top-Line; *viz.* upon three and thirty parts of forty and two, (the Body.)

6. The Stem of *Engliſh* Capitals is ſix parts of forty and two, (the Body.)

7. The Stem of *Engliſh* Lower-Caſe Letters is four parts of forty and two, (the Body.)

¶. 2. *Of Terms relating to the Face of Letters, and their Explanation.*

The Parts of a *Punch* are already deſcribed in §. 13. ¶. 1. of this Volumne; and ſo is the Body: But the ſeveral Terms that relate to the Face of Letters are not yet defined. Now therefore you muſt note, that the Body of a Letter hath four principal Lines paſſing through it (or at leaſt imagined to paſs through it) at Right Angles to the Body; *viz.* The Top-Line, The Head-Line, The Foot-Line, and The Bottom-Line.

Between two of theſe Lines is contained the Heighth of all Letters.

Theſe are called *Lines*, becauſe the Tops, the Heads, the Feet and the Bottoms of all Letters (when Complicated by the *Compoſitor*) ſtand ranging in theſe imagin'd Lines, according as the Heighth and Depth of each reſpective Letter properly requires.

The Long Letters are (as I told you in §. 13. ¶. 1. of this Volumne) contained between the Top and Bottom-Lines, The Aſcending Letters are contained between the Top and Foot-Lines, The Deſcending Letters are contained between the Head and Bottom-Lines, and The Short Letters are contained between the Head and Foot-Lines.

Through what Parts of the Body all theſe Lines paſs, you may ſee by the Drafts of Letters, and the following Deſcriptions.

What the Long Letters, Aſcending Letters, and Short Letters are, I ſhewed in the afore-cited ¶. Therefore I ſhall now proceed to particular Terms relating to the Face. As,

1. The Topping, is the ſtraight fine Stroak or Stroaks that lie in the Top-Line of Aſcending Letters: In *Roman* Letters they paſs at Right Angles through the Stems; but in *Italicks*, at Oblique Angles to the Stems; as you may ſee in the Drafts of Letters, B, *B*, H, *H*, I, *I*, *&c.*

2. The Footing, is the ſtraight fine Stroak or Stroaks that lie in the Foot-Line of Letters, either Aſcending or Deſcending. In *Romans* they paſs at Right Angles through the Stem, but in *Italicks*, at Oblique Angles; as you may ſee in B, *B*, H, *H*, I, *I*. *&c.*

3. The Bottom-Footing, is the ſtraight fine Stroaks that lie in the Bottom-Line of Deſcending Letters. In *Romans* they paſs at Right Angles through the Stem; but in *Italicks* at Oblique Angles; as you may ſee p, *p*, q, *q*.

4. The Stem is the ſtraight Fat Stroak of the Letter: as in B, *B*, the ſtraight Stroak on the Left Hand is the Stem; and I, *I*, is all Stem, except the Footing and Topping.

5. Fat-Stroaks. The Stem or broad Stroak in a Letter is called Fat; as the Right Hand Stroak in A, and part of the great Arch in B, are Fat-Stroaks.

6. Lean Stroaks, are the narrow fine Stroaks in a Letter; as the Left Hand Stroak of A, and the Right Hand Stroak of V are Lean.

7. Beak of Letters, is the fine Stroak or Touch that ſtands on the Left Hand of the Stem, either in the Top-Line, as b d h, *&c.* or in the Head-Line, as i, m, n, *&c.* Yet f, g, ſ, *f*, *g*, *ſ*, have Beaks on the Right Hand of the Stem.

8. Tails of Letters, is a Stroak proceeding from the Right Hand Side of the Stem, in the Foot-Line; as a d t u: and moſt *Italick* Lower-Caſe Letters have Tails: As alſo have moſt Swaſh Letters. But ſeveral of their Tails reach down to the Bottom-Line.

9. Swaſh Letters are *Italick* Capitals; as you ſee in *Plate* 15.

Thus much of *Letter-Cutting*. The next *Exerciſes* ſhall (God willing) be upon *Making Matrices*, *Making Molds*, *Caſting and Dreſſing of Letters*, &c.

FINIS.

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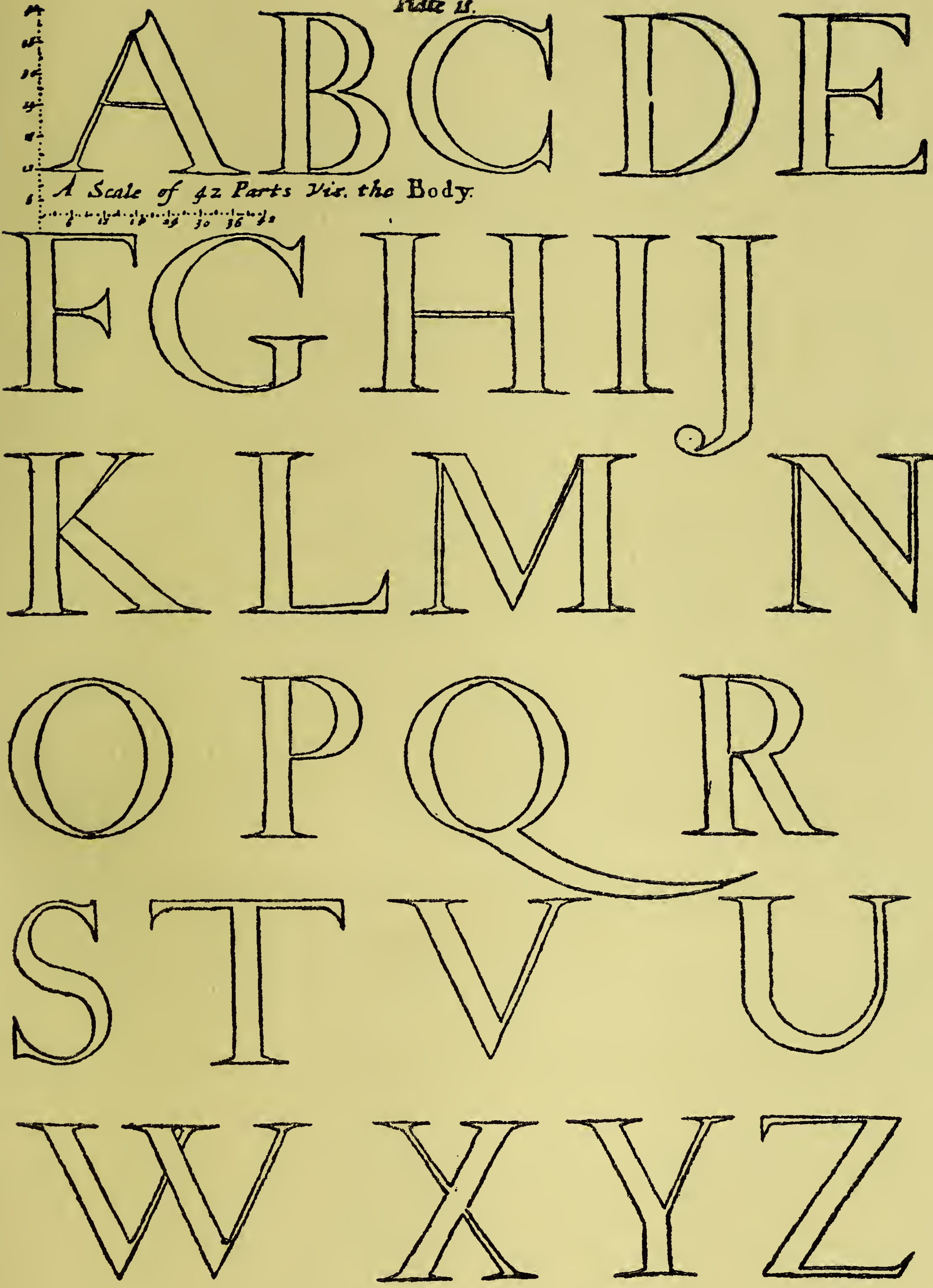
Plate 11.


42
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A B C D E
A Scale of 42 Parts Vis. the Body.
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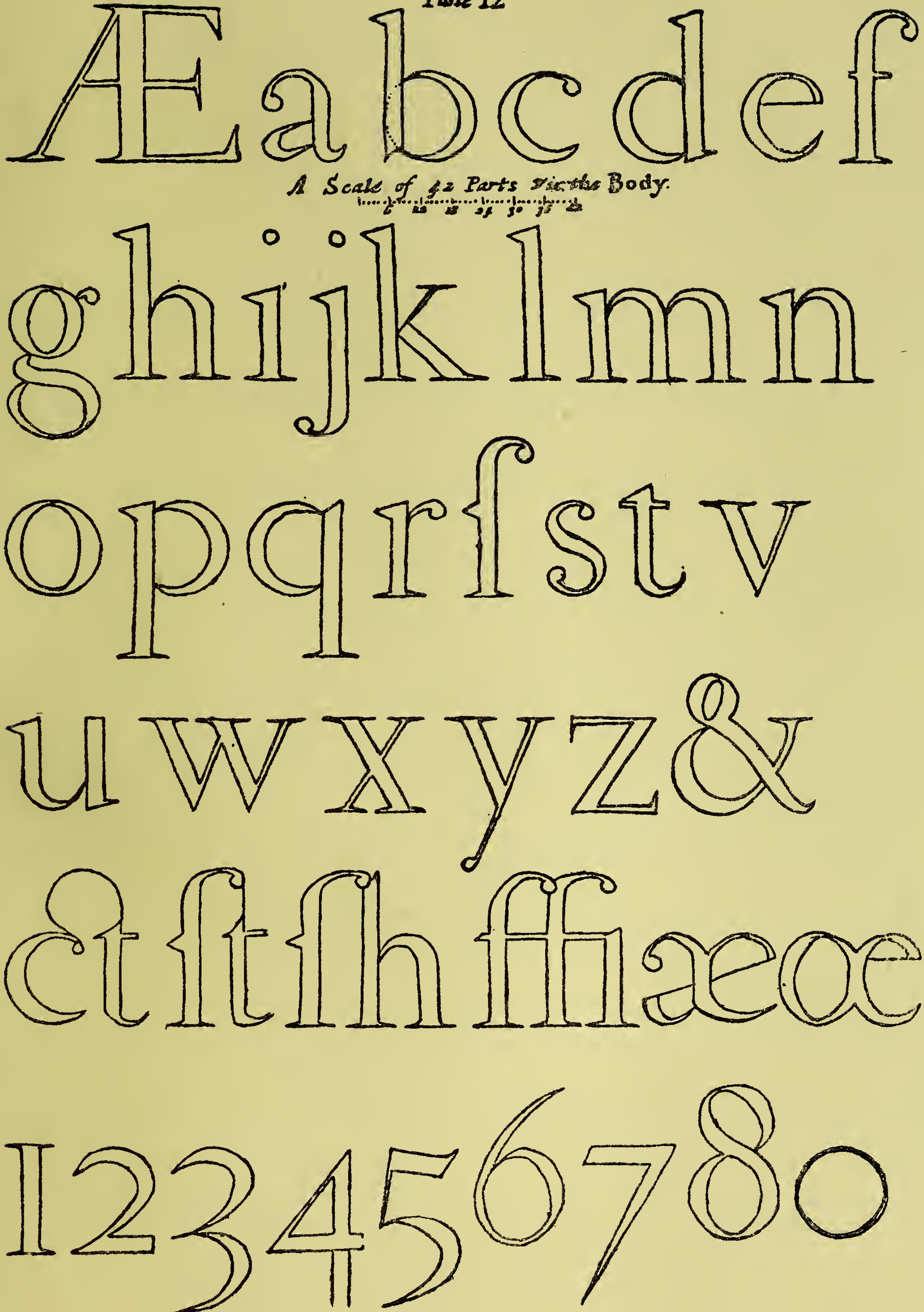
Plate 12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